

# LIVES IN ECOLOGY

John Scales Avery

September 12, 2019

# INTRODUCTION<sup>1</sup>

## **We face an ecological crisis**

The Industrial Revolution marked the start of massive human use of fossil fuels. The stored energy from several hundred million years of plant growth began to be used at roughly a million times the rate at which it had been formed. The effect on human society was like that of a narcotic. There was a euphoric (and totally unsustainable) surge of growth of both population and industrial production. Meanwhile, the carbon released into the atmosphere from the burning of fossil fuels began to duplicate the conditions which led to the 5 geologically-observed mass extinctions, during each of which more than half of all living species disappeared forever.

Industrialism and the rapid development of science and technology have given some parts of the world a 200-year period of unbroken expansion and growth, but today this growth is headed for a collision with a wall-like barrier - limits set by the carrying capacity of the global environment and by the exhaustion of non-renewable resources. Encountering these limits is a new experience for the the industrialized countries. By contrast, pre-industrial societies have always experienced limits. The industrialized world must soon replace the economics of growth with equilibrium economics. Pre-industrial societies have already learned to live in equilibrium - in harmony with nature.

It is assumed by many people in the industrialized North that if the developing countries would only learn mass production, modern farming techniques and a modern lifestyle, all would be well. However, a sustainable global future may require a transfer of knowledge, techniques and attitudes in precisely the opposite direction - from pre-industrial societies to highly industrialized ones. The reason for this is that the older societies have cultures that allow them to live in a sustainable way, in harmony with nature. This is exactly what the highly industrial North must learn to do.

This book reviews the lives and thoughts of some of the women and men who have addressed the crucial problems of ecology and sustainability that we are currently facing. I have tried to let them speak to us in their own words. We need their voices today!

---

<sup>1</sup>This book makes use of articles and book chapters that I have previously written on subjects related to ecology, but a great deal of new material has been added.

# Contents

<b>1</b>	<b>INDIGENOUS PEOPLES</b>	<b>7</b>
1.1	Learning to live in harmony . . . . .	7
1.2	Luther Standing Bear . . . . .	11
1.3	The earth is our mother . . . . .	19
1.4	Crimes against indigenous peoples . . . . .	24
<b>2</b>	<b>SAINT FRANCIS</b>	<b>41</b>
2.1	The life of Saint Francis . . . . .	41
2.2	<i>Canticle of the Sun</i> . . . . .	43
2.3	Canonization . . . . .	44
2.4	<i>A prayer of Saint Francis</i> . . . . .	44
<b>3</b>	<b>HENRY DAVID THOREAU</b>	<b>55</b>
3.1	Harmony with nature . . . . .	56
3.2	On the Duty of Civil Disobedience . . . . .	65
<b>4</b>	<b>JOHN MUIR</b>	<b>67</b>
4.1	The life of John Muir . . . . .	67
4.2	Places named after John Muir . . . . .	78
4.3	National parks in the United States . . . . .	78
<b>5</b>	<b>JOHN TYNDALL AND SVANTE ARRHENIUS</b>	<b>91</b>
5.1	John Tyndall . . . . .	91
5.2	Svante Arrhenius . . . . .	98
5.3	The Keeling curve . . . . .	101
<b>6</b>	<b>RACHEL CARSON</b>	<b>107</b>
6.1	From child author to marine biologist . . . . .	107
6.2	The Sea Around Us . . . . .	111
6.3	The Silent Spring . . . . .	113
6.4	Overuse of pesticides and the insect apocalypse . . . . .	117

<b>7</b>	<b>JANE GOODALL</b>	<b>121</b>
7.1	Growing up with a love of animals . . . . .	121
7.2	Africa, Leakey and the search for early human behavior . . . . .	121
7.3	The Gombe research project . . . . .	123
7.4	Roots and Shoots, and the Jane Goodall Institute . . . . .	127
<b>8</b>	<b>HUMAN ECOLOGY</b>	<b>133</b>
8.1	Paul R. Ehrlich and Anne H. Ehrlich . . . . .	133
8.2	John P. Holdren . . . . .	137
8.3	Barry Commoner . . . . .	141
8.4	The global food and refugee crisis . . . . .	146
<b>9</b>	<b>WANGARI MAATHAI</b>	<b>169</b>
9.1	The life and work of Wangari Maathai . . . . .	169
9.2	Illegal burning for palm oil plantations . . . . .	175
9.3	Jair Bolsonaro's attack on the Amazon rainforest . . . . .	176
9.4	Growing populations and forest loss . . . . .	180
9.5	Desertification and soil erosion . . . . .	181
9.6	Forest drying and wildfires: a feedback loop . . . . .	182
9.7	Degraded forests are carbon emitters . . . . .	182
9.8	Replanting forests . . . . .	183
<b>10</b>	<b>POPE FRANCIS I</b>	<b>187</b>
10.1	From Argentina to Rome . . . . .	187
10.2	Pope Francis addresses the climate emergency . . . . .	188
10.3	Pope Francis meets Leonardo DiCaprio . . . . .	197
<b>11</b>	<b>JAMES HANSEN, BILL MCKIBBEN, AND AOC</b>	<b>201</b>
11.1	Understanding the atmosphere of Venus . . . . .	201
11.2	350.org . . . . .	202
11.3	The Climate Movement: What's Next? . . . . .	202
11.4	Bill McKibben . . . . .	204
11.5	Alexandria Ocasio-Cortez . . . . .	207
11.6	Realities of climate change . . . . .	211
<b>12</b>	<b>NAOMI KLEIN</b>	<b>231</b>
12.1	From mall-junkie to environmentalist . . . . .	231
12.2	Naomi Klein on the urgency of the Green New Deal . . . . .	235
12.3	The Sunrise Movement . . . . .	238
12.4	The Extinction Rebellion . . . . .	242

<b>13 HELENA NORBERG-HODGE AND MAUDE BARLOW</b>	<b>245</b>
13.1 Ancient futures . . . . .	245
13.2 Maude Barlow: water as a human right . . . . .	252
13.3 The global water crisis . . . . .	257
<b>14 SIR DAVID ATTENBOROUGH</b>	<b>265</b>
14.1 Family background and childhood . . . . .	265
14.2 Career at the BBC . . . . .	269
14.3 Disaster! . . . . .	275
14.4 Climate Change, The Facts . . . . .	278
14.5 Sir David testifies in Parliament . . . . .	279
<b>15 AL GORE</b>	<b>283</b>
15.1 An Inconvenient Truth . . . . .	283
15.2 Climate change denial in the mass media . . . . .	285
15.3 Showing unsustainable lifestyles in the mass media . . . . .	289
15.4 Alternative media . . . . .	289
<b>16 GRETA THUNBERG</b>	<b>295</b>
16.1 Greta Thunberg's TED talk . . . . .	295
16.2 Only immediate climate action can save the future . . . . .	298
16.3 Worldwide school strike, 15 March, 2019 . . . . .	302
16.4 The World Meteorological Organization's report . . . . .	309
16.5 Only 12 years left to limit climate change catastrophe . . . . .	309
16.6 COP24, the climate summit in Poland . . . . .	310
16.7 The UK declares a climate emergency . . . . .	320
16.8 Understatement of existential climate risk . . . . .	321
16.9 The 2018 IPCC report . . . . .	326



# Chapter 1

## INDIGENOUS PEOPLES

### 1.1 Learning to live in harmony

#### We need to learn from long-established cultures

The era of colonialism has left the industrialized countries with a rather arrogant attitude towards other cultures. Although formal political colonialism has almost entirely vanished, many of the assumptions of the colonial era persist and are strongly supported by the mainstream mass media.

Like biodiversity, cultural diversity is an extremely valuable resource, and for similar reasons. A large genetic pool gives living organisms the flexibility needed to adapt to changes in the environment. Similarly, cultural diversity can give humans the flexibility needed to cope with change. In the changed world of today (changed by the invention of thermonuclear weapons and by the extraordinary growth of global population and commerce) we urgently need to learn to live in harmony, in harmony with ourselves, in harmony with nature, and in harmony with other members of our species. We can do this if we draw on the full human heritage of cultural diversity. We can draw not only on the knowledge and wisdom of presently existing societies, but also on the experiences and ideas of societies of the past.

- **The Pythagorean concept of harmony:** In the ancient world, the concept of harmony was developed to a high level by the Pythagoreans. The Pythagoreans used the idea of harmony to understand medicine, music, mathematics and ethics.
- **The concept of harmony in Chinese civilization:** Chinese civilization is very ancient, and it has made many extremely important contributions to the cultural heritage of the world - for example, the invention of paper, ink, printing and the magnetic compass. Agriculture began in China as early as 6,000 B.C. The art of working in bronze was developed in China during the Shang dynasty (1,500 B.C. - 1,100 B.C.) and it reached a high pitch of excellence in the Chou dynasty (1,100 B.C. - 250 B.C.).

In the Chou period, many of the cultural characteristics which we recognize as particularly Chinese were developed. During this period, the Chinese evolved a code of behavior based on politeness and ethics. Much of this code of behavior is derived from the teachings of K'ung Fu-tzu (Confucius), a philosopher and government official who lived between 551 B.C. and 479 B.C.. The "Golden Rule" was known to K'ung Fu-tzu, but was formulated in a negative way: "Do not do to others anything that you would not like them do to you".

The rational teachings of K'ung Fu-tzu were complemented by the more mystical and intuitive doctrines of Lao-tzu and his followers. Lao-tzu lived at about the same time as K'ung Fu-tzu, and he founded the Taoist religion. The Taoists believed that unity with nature could be achieved by passively blending oneself with the forces of nature.

On the whole, politicians and scholars followed the practical teachings of K'ung Fu-tzu, while poets and artists became Taoists. The intuitive sensitivity to nature inspired by Taoist beliefs allowed these artists and poets to achieve literature and art of unusual vividness and force with great economy of means. The Taoist religion has much in common with Buddhism, and its existence in China paved the way for the spread of Buddhism from India to China and Japan.

Taoist and Confucian teachings each emphasized a particular aspect of harmony. Taoism emphasized harmony with nature, while Confucianism taught harmonious relationships between humans. Thus in China, harmony became an ideal advocated by both traditions. The Chinese respect for harmony as an ideal can be seen, for example, in the beautiful Temple of Divine Harmony in Beijing.

- **India:** Evidence of a very early river-valley civilization in India has been found at a site called Mohenjo-Daro. However, in about 2,500 B.C., this early civilization was destroyed by some great disaster, perhaps a series of floods; and for the next thousand years, little is known about the history of India. During this dark period between 2,500 B.C. and 1,500 B.C., India was invaded by the Indo-Aryans, who spoke Sanskrit, a language related to Greek. The Indo-Aryans partly drove out and partly enslaved the native Dravidians. However, there was much intermarriage between the groups, and to prevent further intermarriage, the Indo-Aryans introduced a caste system sanctioned by religion.

According to Hindu religious belief, the soul of a person who has died is reborn in another body. If, throughout his life, the person has faithfully performed the duties of his caste, then his or her soul may be reborn into a higher caste. Finally, after existing as a Brahman, the soul may be so purified that it can be released from the cycle of death and rebirth.

In the 6th century B.C., Gautama Buddha founded a new religion in India. Gautama Buddha was convinced that all the troubles of humankind spring from an excessive attachment to earthly things. He felt that the only escape from sorrow is through

the renunciation of earthly desires. He also urged his disciples to follow a high ethical code, the Eightfold Way. Among the sayings of Buddha are the following:

“Hatred does not cease by hatred at any time; hatred ceases by love.”

“Let a man overcome anger by love; let him overcome evil by good.”

“All men tremble at punishment. All men love life. Remember that you are like them, and do not cause slaughter.”

Both Hindu and Buddhist traditions emphasize the unity of all life on earth. Hindus regard killing an animal as a sin, and many try to avoid accidentally stepping on insects as they walk. (The Hindu and Buddhist picture of the relatedness of all life on earth has been confirmed by modern biological science. We now know that all living organisms have the same fundamental biochemistry, based on DNA, RNA, proteins and polysaccharides, and we know that our own human genomes are more similar to than different from the genomes of our close relations in the animal world.)

The peoples of the industrialized nations urgently need to acquire a non-anthropocentric element in their ethics, similar to reverence for all life found in the Hindu and Buddhist traditions, as well as in the teachings of Saint Francis of Assisi and Albert Schweitzer. We need to learn to value other species for their own sakes, and not because we expect to use them for our own economic goals.

The Buddhist concept of karma has great value in human relations. The word “karma” means simply “action”. In Buddhism, one believes that actions return to the actor. Good actions will be returned, and bad actions will also be returned. This is obviously true in social relationships. If we behave with kindness and generosity to our neighbors, they will return our kindness. Conversely, a harmful act may lead to a vicious circle of revenge and counter-revenge which can only be broken by returning good for evil. However the concept of karma has a broader and more abstract validity beyond the direct return of actions to the actor.

When we perform a good action, we increase the total amount of good karma in the world. If all people similarly behave well, the the world as a whole will become more pleasant and more safe. Human nature seems to have a built-in recognition of this fact, and we are rewarded by inner happiness when we perform good and kind actions. In his wonderful book, “Ancient Wisdom, Modern World”, the Dalai Lama says that good actions lead to happiness and bad actions to unhappiness even if our neighbors do not return these actions. Inner peace, he tells us, is incompatible with bad karma and can be achieved only through good karma, i.e. good actions.

There is a great deal of similarity between the Buddhist concept of karma and some of the ethical principles of Christianity, particularly principles that appear in the Sermon on the Mount. Also Buddha’s saying “Hatred does not cease by hatred at any time; hatred ceases by love” echoes the Christian principle of returning good for

evil. Both are aimed at stopping vicious circles of revenge and counter-revenge, such as those that can now be observed in the Middle East.

- **Bhutan** Before the doors of Bhutan were cautiously opened to visitors in 1974, the country remained aloof from the modern world. One of the most striking characteristics of the ancient Bhutanese culture was that most of the actions of its citizens were done from a sense of duty and tradition, rather than for economic reasons. The citizens of Bhutan derived great happiness from these actions. For example, caring for the elderly was to them not only a duty but also a great source of pleasure. It is doubtful whether modernization will increase the happiness of the Bhutanese.
- **Harmony with nature in the Native American culture:** The attitude towards nature of the Sioux can be seen from the quotations from *Land of the Spotted Eagle* and other books by the Lakota (Western Sioux) chief, Standing Bear (ca. 1834-1908), which will be given in detail below. A similar attitude towards nature can be found in traditional Inuit cultures.
- **St. Francis of Assisi (1181-1226) and Mahatma Gandhi (1869-1948):** There are similarities between the doctrines of these two great ethical teachers. Both came from wealthy families, but during the course of their lives they acquired strong sympathy with the poor and rejected excessive attachment to worldly goods. Both dressed in the simplest possible rough homespun clothes. (Gandhi said, “Live simply that others may simply live.”) Both taught peace between humans and kindness to all life. St. Francis is said to have preached sermons to the birds; Gandhi personally took care of sick animals in his ashram.
- **Respect for nature in African cultures:** In some parts of Africa, a man who plans to cut down a tree offers a prayer of apology, telling the tree why necessity has forced him to harm it. This pre-industrial attitude is something from which the industrialized North could learn. In industrial societies, land “belongs” to some one, and the owner has the “right” to ruin the land or to kill the communities of creatures living on it if this happens to give some economic advantage, in much the same way that a Roman slaveowner was thought to have the “right” to kill his slaves. Pre-industrial societies have a much less rapacious and much more custodial attitude towards the land and towards its non-human inhabitants.
- **Preservation of the land for future generations:** Many traditional agricultural societies have an ethical code that requires them to preserve the fertility of the land for future generations. This recognition of a duty towards the distant future is in strong contrast to the shortsightedness of modern economists. For example, John Maynard Keynes has been quoted as saying “In the long run, we will all be dead”, meaning that we need not look that far ahead. By contrast, members of traditional agricultural societies recognize that their duties extend far into the distant future, since their descendants will still be alive.

The pre-industrial societies and ethical teachers mentioned above have much to tell us about how to achieve harmony with ourselves, harmony with nature, and harmony with other members of our own species. Of course it is necessary to learn from the best aspects of each culture and not the worst. Also we must remember that the population of the world is now so large that a complete return to a pre-industrial way of life would not be possible. However, some of the values and attitudes of pre-industrial cultures can help us to an awareness of what it will take to achieve a truly sustainable global society.

The advertising-driven orgies of consumerism that characterize modern market economies cannot be extended into the distant future because of limitations that will be imposed by exhaustion of non-renewable resources and by the limited carrying capacity of the global environment. Therefore we need to stop using material goods as a measure of merit. Gandhi deliberately reduced his possessions to a minimum in order to demonstrate that merit and goods are not synonymous. St. Francis did the same. We can learn from them, and from the values of pre-industrial societies, to stop worshiping the false ideals, *Power*, *Dominance*, *Growth*, and *Profit*. Instead we must learn to live in *Harmony*.

## 1.2 Luther Standing Bear

Luther Standing Bear (1868-1939) was a native American Lakota chief. He spanned both his native traditions and the white culture, having received an education at the Carlisle Industrial School. He became the author of many books, for example *My People*, *The Sioux*, *My Indian Boyhood*, and *Land of the Spotted Eagle*.

### Some quotations from Luther Standing Bear

The old Lakota was wise. He knew that man's heart away from nature becomes hard; he knew that lack of respect for growing, living things soon led to lack of respect for humans, too.

Out of the Indian approach to life there came a great freedom, an intense and absorbing respect for life, enriching faith in a Supreme Power, and principles of truth, honesty, generosity, equity and brotherhood as a guide to mundane relations.

As a child I understood how to give, I have forgotten this grace since I have become civilized.

There is a road in the hearts of all of us, hidden and seldom traveled, which leads to an unknown, secret place. The old people came literally to love the soil, and they sat or reclined on the ground with a feeling of being close to a mothering power. Their teepees were built upon the earth and their altars were made of earth. The soul was soothing, strengthening, cleansing, and heal-



Figure 1.1: Chief Luther Standing Bear (1868-1939), author and philosopher. In one of his books, he wrote: “I find [a] great distinction between the faith of the Indian and the white man. Indian faith sought the harmony of man with his surroundings, the other sought the dominance of surroundings.”

ing. That is why the old Indian still sits upon the earth instead of propping himself up and away from its life giving forces. For him, to sit or lie upon the ground is to be able to think more deeply and to feel more keenly. He can see more clearly into the mysteries of life and come closer in kinship to other lives about him.

Hollow Horn Bear knew that to be leader and adviser of his people he must be honest and reliable, and that his word once given in promise must never be taken back. He knew that he must be a man of will-power, standing for the right no matter what happened to him personally; that he must have strength of purpose, allowing no influence to turn him from doing what was best for the tribe. He must be willing to serve his people without thought of pay. He must be utterly unselfish and kind-hearted to the old and poor and stand ready to give to those in need. Above all, he must be unafraid to deal equal justice to all.

Generosity is a mark of bravery, so all Sioux boys were taught to be generous.

Wherever forests have not been mowed down, wherever the animal is recessed in their quiet protection, wherever the earth is not bereft of four-footed life - that to the white man is an 'unbroken wilderness.' But for us there was no wilderness, nature was not dangerous but hospitable, not forbidding but friendly. Our faith sought the harmony of man with his surroundings; the other sought the dominance of surroundings. For us, the world was full of beauty; for the other, it was a place to be endured until he went to another world. But we were wise. We knew that man's heart, away from nature, becomes hard.

Kinship with all creatures of the earth, sky, and water was a real and active principle. In the animal and bird world there existed a brotherly feeling that kept us safe among them... The animals had rights - the right of man's protection, the right to live, the right to multiply, the right to freedom, and the right to man's indebtedness. This concept of life and its relations filled us with the joy and mystery of living; it gave us reverence for all life; it made a place for all things in the scheme of existence with equal importance to all.

And here I find the great distinction between the faith of the Indian and the white man. Indian faith sought the harmony of man with his surroundings, the other sought the dominance of surroundings.

## Hubris has replaced respect

Hunter-gatherers traditionally respected nature. However, when the agricultural revolution allowed humans to live in larger groups, respect for nature was forgotten, and humankind began to be seen as the ruler of the natural world, rather as a part of it. We can see this attitude in the following excerpt from *Antigone*, by Aristophanes (c. 446 - c. 386 BC):

*Numberless are the world's wonders, but none  
More wonderful than man; the storm-gray sea  
Yields to his prows, the huge crests bear him high;  
Earth, holy and inexhaustible, is graven  
With shining furrows where his plows have gone  
Year after year, the timeless labor of stallions.  
The light-boned birds and beasts that cling to cover,  
The lithe fish lighting their reaches of dim water,  
All are taken, tamed in the net of his mind;  
The lion on the hill, the wild horse windy-maned,  
Resign to him; and his blunt yoke has broken  
The sultry shoulders of the mountain bull.  
Words also, and thought as rapid as air,  
He fashions to his good use; statecraft is his  
And his the skill that deflects the arrows of snow...*

## New goals for education

Good education ought to make students well adapted to live in their environment. In the largest sense, “environment” means not only the family setting but also the political, economic and natural environments that surround young people as they grow up today. These environments have changed almost beyond recognition during the last few centuries; in fact, they have changed enormously during the last few decades, and consequently traditional education is in great need of revision. When Samuel Johnson visited the Birmingham factory where James Watt’s newly-invented steam engines were being manufactured during the first stages of the Industrial Revolution, the owner proudly said to him, “I sell here, Sir, what all the world desires to have - Power!” Power, Growth, Dominance and Profit have been the traditional ideals of industrial society. However, it is doubtful whether they are appropriate ideals for the present and the future. In this section we will discuss the reasons why Harmony is a much better ideal and a better goal for education in the world of today.



Figure 1.2: We must be the friend of nature. We must respect nature.



Figure 1.3: We are not the rulers of nature. We are a part of nature, on equal footing with plants and animals.



Figure 1.4: We must learn to derive more of our happiness from enjoyment of the beauty of the natural world.



Figure 1.5: Even the humblest living creature is worthy of our respect and wonder. This is what Albert Schweitzer meant when he spoke of “reverence for life”.

## Loss of biodiversity

Tropical forests are being destroyed at an alarming rate, with a catastrophic loss of biodiversity. The burning of fossil fuels and the destruction of tropical forests have produced an increase of carbon dioxide in the earth's atmosphere and a steadily increasing average global temperature. Tropical rain forests are thought to be the habitat of more than half of the world's species of plants, animals and insects; and their destruction is accompanied by an alarming rate of extinction of species. The Harvard biologist, E.O. Wilson, estimates that the rate of extinction resulting from deforestation in the tropics may now exceed 4,000 species per year - 10,000 times the natural background rate (*Scientific American*, September, 1989).

The enormous biological diversity of tropical rain forests has resulted from their stability. Unlike northern forests, which have been affected by glacial epochs, tropical forests have existed undisturbed for millions of years. As a result, complex and fragile ecological systems have had a chance to develop. Professor Wilson expresses this in the following words: *Fragile superstructures of species build up when the environment remains stable enough to support their evolution during long periods of time. Biologists now know that biotas, like houses of cards, can be brought tumbling down by relatively small perturbations in the physical environment. They are not robust at all.*

The number of species which we have until now domesticated or used in medicine is very small compared with the number of potentially useful species still waiting in the world's tropical rain forests. When we destroy them, we damage our future. But we ought to regard the annual loss of thousands of species as a tragedy, not only because biological diversity is potential wealth for human society, but also because every form of life deserves our respect and protection.

Every year, more than 100,000 square kilometers of rain forest are cleared and burned, an area which corresponds to that of Switzerland and the Netherlands combined. Almost half of the world's tropical forests have already been destroyed. Ironically, the land thus cleared often becomes unsuitable for agriculture within a few years.

Tropical soils may seem to be fertile when covered with luxuriant vegetation, but they are usually very poor in nutrients because of leeching by heavy rains. The nutrients which remain are contained in the vegetation itself; and when the forest cover is cut and burned, they are rapidly leached away. Often the remaining soil is rich in aluminum oxide and iron oxide. When such soils are exposed to oxygen and sun-baking, a rocklike substance called laterite is formed. The temples of Angkor Wat in Cambodia are built of laterite; and it is thought that the Khmer civilization, which built these temples a thousand years ago, disappeared because of laterization of the soil.

## The mathematical properties of exponential growth

Our economists, whose education is based on the assumptions of Adam Smith and other economic thinkers of the early Industrial Revolution, still continue to regard Growth as the Holy Grail. A 5% rate of growth is considered to be the mark of a healthy economy. This

blind faith in growth can only be maintained by ignoring not only the rapid approach of the global economy to limits imposed by the carrying capacity of the earth's environment, but also by ignoring the mathematical properties of exponential growth. Economists apparently refuse to look more than a decade or so into the future. What they would see, if they looked a little farther, is that a 5 percent rate of growth implies that whatever is growing will double in 14 years, grow by a factor of 132 in a century, by a factor of 17,292 in two centuries, by a factor of 2,273,996 in three centuries, and so on. Thus, in the long run, economic growth cannot possibly be sustainable; nor can population growth be sustainable, as can be seen from the mathematics of any type of exponential growth.

The goals of education, especially the education of economists, need to be changed in such a way as to include a realistic picture of today's world. All students, especially economists, must learn the fact that in the long run neither population growth nor economic growth is sustainable. A new kind of economics should be taught - not "empty world" economics but "full world" economics; not the economics of growth but the economics of equilibrium and stability.

## **The social impact of science**

Let us consider some other ways in which the world is changing, all of which imply a need for new goals in education. Science and technology have developed extremely rapidly in recent decades, and they will undoubtedly continue to do so in the future. The result has been that humans now have an unprecedented and constantly increasing power over nature, which can be used for both good and evil. Science has given us the possibility of a life free from hunger and free from the constant threat of death through infectious disease. At the same time, however, our constantly accelerating technology has given us the possibility of destroying civilization in a thermonuclear war.

Since it is almost impossible to prevent science from making new discoveries that can be used both constructively and disastrously, one of the new goals of education must be to give voters the knowledge needed to choose wisely the among ways in which our enormous new powers over nature can to be used. This implies that some familiarity with science is needed even for students who specialize in the humanities. A study of the history and social impact of science ought to be part of the education of both scientists and humanists. This should include discussions of global problems and ethical dilemmas related to scientific and technological progress. Scientists also need some background in the humanities in order to see their work as part of a larger picture.

## **Global ethics**

Traditional education has always tried to produce patriotism in its students. This may once have been a reasonable goal, but today a broader view than narrow nationalism is needed. Global interdependence and communication have increased to such an extent that the absolutely sovereign nation-state has become a dangerous anachronism. If the disaster of a third world war is to be avoided, structures of government and law must be built up

at an international level. One of the new goals for education should be to prepare students for this great task. Today's students need a global ethic - a loyalty to humanity as a whole, rather than a narrowly nationalistic loyalty.

History has traditionally been taught in such a way that one's own nation is seen as being heroic and always in the right. History textbooks also emphasize power, dominance and military conflicts. A reformed teaching of history might instead be a chronicle of the gradual cultural advances of humankind as a whole, giving adequate recognition to the contributions of all nations and peoples, and giving weight to constructive achievements rather than to power struggles and conflicts.

## 1.3 The earth is our mother

### The World People's Conference on Climate Change and the Rights of Mother Earth

This conference took place in Tiquipaya, just outside the city of Cochabamba, Bolivia, from April 19-22, 2010. The event was attended by around 30,000 people from over 100 countries. It was hosted by the Bolivian government, and the proceedings were transmitted online by the organizations OneClimate and Global Campaign for Climate Action.

One of the outstanding results of the conference was the drafting of a Universal Declaration of the Rights of Mother Earth, modeled on the United Nations' Universal Declaration of Human Rights. Both Declarations might be criticized for being unrealistic,<sup>1</sup> but both have great normative value. They define the goals towards which we ought to be striving.

### Proposed Universal Declaration of the Rights of Mother Earth<sup>2</sup>

#### Preamble

*We, the peoples and nations of Earth:*

- *considering that we are all part of Mother Earth, an indivisible, living community of interrelated and interdependent beings with a common destiny;*
- *gratefully acknowledging that Mother Earth is the source of life, nourishment and learning and provides everything we need to live well;*
- *recognizing that the capitalist system and all forms of depredation, exploitation, abuse and contamination have caused great destruction, degradation and disruption of Mother Earth, putting life as we know it today at risk through phenomena such as climate change;*

---

<sup>1</sup><https://www.transcend.org/tms/2012/12/human-rights-a-letter-to-santa-claus/>

<sup>2</sup><https://www.theguardian.com/environment/2011/apr/10/bolivia-enshrines-natural-worlds-rights>  
<https://pwccc.wordpress.com>

- *convinced that in an interdependent living community it is not possible to recognize the rights of only human beings without causing an imbalance within Mother Earth;*
- *affirming that to guarantee human rights it is necessary to recognize and defend the rights of Mother Earth and all beings in her and that there are existing cultures, practices and laws that do so;*
- *conscious of the urgency of taking decisive, collective action to transform structures and systems that cause climate change and other threats to Mother Earth;*
- *proclaim this Universal Declaration of the Rights of Mother Earth, and call on the General Assembly of the United Nation to adopt it, as a common standard of achievement for all peoples and all nations of the world, and to the end that every individual and institution takes responsibility for promoting through teaching, education, and consciousness raising, respect for the rights recognized in this Declaration and ensure through prompt and progressive measures and mechanisms, national and international, their universal and effective recognition and observance among all peoples and States in the world.*

## **Article 1: Mother Earth**

1. *Mother Earth is a living being.*
2. *Mother Earth is a unique, indivisible, self-regulating community of interrelated beings that sustains, contains and reproduces all beings.*
3. *Each being is defined by its relationships as an integral part of Mother Earth.*
4. *The inherent rights of Mother Earth are inalienable in that they arise from the same source as existence.*
5. *Mother Earth and all beings are entitled to all the inherent rights recognized in this Declaration without distinction of any kind, such as may be made between organic and inorganic beings, species, origin, use to human beings, or any other status.*
6. *Just as human beings have human rights, all other beings also have rights which are specific to their species or kind and appropriate for their role and function within the communities within which they exist.*
7. *The rights of each being are limited by the rights of other beings and any conflict between their rights must be resolved in a way that maintains the integrity, balance and health of Mother Earth.*

**Article 2. Inherent Rights of Mother Earth**

1. *Mother Earth and all beings of which she is composed have the following inherent rights:*
  - (a) *the right to life and to exist;*
  - (b) *the right to be respected;*
  - (c) *the right to regenerate its bio-capacity and to continue its vital cycles and processes free from human disruptions;*
  - (d) *the right to maintain its identity and integrity as a distinct, self-regulating and interrelated being;*
  - (e) *the right to water as a source of life;*
  - (f) *the right to clean air;*
  - (g) *the right to integral health;*
  - (h) *the right to be free from contamination, pollution and toxic or radioactive waste;*
  - (i) *the right to not have its genetic structure modified or disrupted in a manner that threatens its integrity or vital and healthy functioning;*
  - (j) *the right to full and prompt restoration the violation of the rights recognized in this Declaration caused by human activities;*
2. *Each being has the right to a place and to play its role in Mother Earth for her harmonious functioning.*
3. *Every being has the right to wellbeing and to live free from torture or cruel treatment by human beings.*

**Article 3. Obligations of human beings to Mother Earth**

1. *Every human being is responsible for respecting and living in harmony with Mother Earth.*
2. *Human beings, and all States guarantee peace and eliminate nuclear, chemical and biological weapons;*
  - (a) *act in accordance with the rights and obligations recognized in this Declaration;*
  - (b) *recognize and promote the full implementation and enforcement of the rights and obligations recognized in this Declaration;*
  - (c) *promote and participate in learning, analysis, interpretation and communication about how to live in harmony with Mother Earth in accordance with this Declaration;*



Figure 1.6: **The earth is our mother.**



Figure 1.7: **Love and respect Mother Earth.**

- (d) *ensure that the pursuit of human wellbeing contributes to the wellbeing of Mother Earth, now and in the future;*
- (e) *establish and apply effective norms and laws for the defense, protection and conservation of the rights of Mother Earth;*
- (f) *respect, protect, conserve and where necessary, restore the integrity, of the vital ecological cycles, processes and balances of Mother Earth;*
- (g) *guarantee that the damages caused by human violations of the inherent rights recognized in this Declaration are rectified and that those responsible are held accountable for restoring the integrity and health of Mother Earth;*
- (h) *empower human beings and institutions to defend the rights of Mother Earth and of all beings;*
- (i) *establish precautionary and restrictive measures to prevent human activities from causing species extinction, the destruction of ecosystems or the disruption of ecological cycles;*
- (j) *guarantee peace and eliminate nuclear, chemical and biological weapons;*
- (k) *promote and support practices of respect for Mother Earth and all beings, in accordance with their own cultures, traditions and customs;*
- (l) *promote economic systems that are in harmony with Mother Earth and in accordance with the rights recognized in this Declaration.*



Figure 1.8: We need reverence for all life, and even reverence for inanimate nature. We need respect and love for Mother Earth. She will return out love.

#### Article 4: Definitions

1. *The term “being” includes ecosystems, natural communities, species and all other natural entities which exist as part of Mother Earth.*
2. *Nothing in this Declaration restricts the recognition of other inherent rights of all beings or specified beings.*

## 1.4 Crimes against indigenous peoples

### Our older brothers can help us today

The distinguished English author Anne Baring describes the indigenous peoples of the world as our “older brothers”. They are anxious to give their “younger brothers” (us) advice about how to preserve the earth, rather than destroying it. But we do not listen. Instead, we murder them because of greed, because we want to take their land.

### Genocides in the Americas

Instances of genocide stain much of human history. Readers of Charles Darwin’s book describing “The Voyage of the Beagle” will remember his horrifying account of General Rosas’ genocidal war against the Amerind population of Argentina. Similar genocidal violence has been experienced by indigenous peoples throughout South and Central America,

and indeed throughout the world.

In general, the cultures of indigenous peoples require much land, and greed for this land is the motive for violence against them. However, the genetic and cultural heritage of indigenous peoples can potentially be of enormous value to humanity, and great efforts should be made to protect them.

In North America, we can recall that military commanders, such as Lord Jeffrey Amherst, deliberately inoculated the Indians with smallpox by giving them blankets from smallpox hospitals. Amherst wrote to his associate, Colonel Henry Bouquet “You will do well to try to inoculate the Indians, by means of blankets, as well as to try every other method that can serve to extirpate this execrable race.” This is clearly an instance of genocide, as well as being an example of the use of biological weapons.

The website of the Holocaust Museum Houston states that “Civil war existed in Guatemala since the early 1960s due to inequalities existing in the economic and political life. In the 1970s, the Maya began participating in protests against the repressive government, demanding greater equality and inclusion of the Mayan language and culture. In 1980, the Guatemalan army instituted “Operation Sophia,” which aimed at ending insurgent guerilla warfare by destroying the civilian base in which they hid. This program specifically targeted the Mayan population, who were believed to be supporting the guerilla movement. Over the next three years, the army destroyed 626 villages, killed or ‘disappeared’ more than 200,000 people and displaced an additional 1.5 million, while more than 150,000 were driven to seek refuge in Mexico. Forced disappearance policies included secretly arresting or abducting people, who were often killed and buried in unmarked graves.”

## **Persistent effects of colonialism**

Part of the extreme economic inequality that exists in today’s world is due to colonial and neocolonial wars.

The Industrial Revolution opened up an enormous gap in military strength between the industrialized nations and the rest of the world. Taking advantage of their superior weaponry, Europe, the United States and Japan rapidly carved up the remainder of the world into colonies, which acted as sources of raw materials and food, and as markets for manufactured goods. Between 1800 and 1914, the percentage of the earth under the domination of colonial powers increased to 85 percent, if former colonies are included.

The English economist and Fabian, John Atkinson Hobson (1858-1940), offered a famous explanation of the colonial era in his book “Imperialism: A Study” (1902). According to Hobson, the basic problem that led to colonial expansion was an excessively unequal distribution of incomes in the industrialized countries. The result of this unequal distribution was that neither the rich nor the poor could buy back the total output of their society. The incomes of the poor were insufficient, and rich were too few in number. The rich had finite needs, and tended to reinvest their money. As Hobson pointed out, reinvestment in new factories only made the situation worse by increasing output.

Hobson had been sent as a reporter by the Manchester Guardian to cover the Second Boer War. His experiences had convinced him that colonial wars have an economic motive.



Figure 1.9: The atrocities committed by the “conquistadors” over the course of three centuries are far too many to be listed here, but there are some that stand out. In the Caribbean, most of the native populations were completely wiped out due to Spanish rapine and diseases. In Mexico, Hernan Cortes and Pedro de Alvarado ordered the Cholula Massacre and the Temple Massacre respectively, killing thousands of unarmed men, women and children. In Peru, Francisco Pizarro captured Emperor Atahualpa in the midst of an unprovoked bloodbath at Cajamarca. Wherever the conquistadors went, death and misery for the natives followed.

Such wars are fought, he believed, to facilitate investment of the excess money of the rich in African or Asian plantations and mines, and to make possible the overseas sale of excess manufactured goods. Hobson believed imperialism to be immoral, since it entails suffering both among colonial peoples and among the poor of the industrial nations. The cure that he recommended was a more equal distribution of incomes in the manufacturing countries.

## Neocolonialism?

In his book, *Neocolonialism, The Last Stage of Imperialism* (Thomas Nielsen, London, 1965), Kwami Nkrumah defined neocolonialism with the following words: “The essence of neocolonialism is that the State which is subject to it is, in theory independent, and has all the outward trappings of international sovereignty. In reality its economic system and thus its political policy is directed from the outside. The methods and form of this direction can take various shapes. For example, in an extreme case, the troops of the imperial power may garrison the territory of the neocolonial State and control the government of it. More often, however, neocolonial control is exercised through monetary means... The struggle against neocolonialism is not aimed at excluding the capital of the developed world from operating in less developed countries. It is aimed at preventing the financial power of the developed countries from being used in such a way as to impoverish the less developed.”

## The resource curse

The way in which the industrialized countries maintain their control over less developed nations can be illustrated by the “resource curse”, i.e. the fact that resource-rich developing countries are no better off economically than those that lack resources, but are cursed with corrupt and undemocratic governments. This is because foreign corporations extracting local resources under unfair agreements exist in a symbiotic relationship with corrupt local officials.

One might think that taxation of foreign resource-extracting firms would provide developing countries with large incomes. However, there is at present no international law governing multinational tax arrangements. These are usually agreed to on a bilateral basis, and the industrialized countries have stronger bargaining powers in arranging the bilateral agreements.

## Racism, colonialism and exceptionalism

It seems to be possible for nations, and the majority of their citizens, to commit the worst imaginable atrocities, including torture, murder and genocide, while feeling that what they are doing is both noble and good. Some understanding of how this is possible can be gained by watching the 3-part BBC documentary, “The History of Racism”.

The series was broadcast by BBC Four in March 2007. and videos of the broadcasts are available on the Internet. Watching this eye-opening documentary can give us much

insight into the link between racism and colonialism. We can also begin to see how both racism and colonialism are linked to exceptionalism and neocolonialism.

Looking at the BBC documentary we can see how often in human history economic greed and colonial exploitation have been justified by racist theories. The documentary describes almost unbelievable cruelties committed against the peoples of the Americas and Africa by Europeans. For example, in the Congo, a vast region which King Leopold II of Belgium claimed as his private property, the women of villages were held as hostages while the men were forced to gather rubber in the forests. Since neither the men nor the women could produce food under these circumstances, starvation was the result.

Leopold's private army of 90,000 men were issued ammunition, and to make sure that they used it in the proper way, the army was ordered to cut off the hands of their victims and send them back as proof that the bullets had not been wasted. Human hands became a kind of currency, and hands were cut off from men, women and children when rubber quotas were not fulfilled. Sometimes more than a thousand human hands were gathered in a single day. During the rule of Leopold, roughly 10,000,000 Congolese were killed, which was approximately half the population of the region.

According to the racist theories that supported these atrocities, it was the duty of philanthropic Europeans like Leopold to bring civilization and the Christian religion to Africa. Similar theories were used to justify the genocides committed by Europeans against the native inhabitants of the Americas. Racist theories were also used to justify enormous cruelties committed by the British colonial government in India. For example, during the great famine of 1876-1878, in which ten million people died, the Viceroy, Lord Lytton, oversaw the export from India to England of a record 6.4 million hundredweight of wheat.

Meanwhile, in Europe, almost everyone was proud of the role which they were playing in the world. All that they read in newspapers and in books or heard from the pulpits of their churches supported the idea that they were serving the non-Europeans by bringing them the benefits of civilization and Christianity. Kipling wrote: "Take up the White Man's burden, Send forth the best ye breed, Go bind your sons to exile, To serve your captives' need; To wait in heavy harness, On fluttered folk and wild, Your new-caught, sullen peoples, Half-devil and half-child." On the whole, the mood of Europe during this orgy of external cruelty and exploitation, was self-congratulatory.

Can we not see a parallel with the self-congratulatory mood of nations of today that export violence, murder, torture and neocolonialism to the whole world, and justify it by thinking of themselves as "exceptional"?

## Suggestions for further reading

1. David Wasdell, *Arctic Dynamics*,  
<http://www.envisionation.co.uk/index.php/videos/arctic-dynamics>
2. Wikipedia, *Climate change in the Arctic*,
3. World Bank, *Climate Change Report Warns of Dramatically Warmer World This Century*,

- <http://www.worldbank.org/en/news/feature/2012/11/18/Climate-change-report-warns-dramatically-warmer-world-this-century>
4. Wikipedia, *Retreat of glaciers since 1850*,
  5. Natural Resources Defense Council, *Climate Change, Water, and Risk: Current water demands are not sustainable*, <http://www.nrdc.org/globalwarming/watersustainability/files/Wat>
  6. Wikipedia, *2011 East Africa drought*,
  7. OXFAM *Working for the Few: Political capture and economic inequality*, <http://www.oxfam.org/en/rfew>
  8. Winnie Byanyima, *Inequality Is Not Inevitable: It's Time to Even It Up!*, Common Dreams <http://www.commondreams.org/views/2014/10/30/inequality-not-inevitable-its-time-even-it>
  9. Abarbanel A, McClusky T (1950) *Is the world getting warmer?* Saturday Evening Post, 1 Jul, p22
  10. Bagdikian BH (2004) *The New Media Monopoly*. Boston, MA, USA: Beacon
  11. Bennett WL (2002) *News: The Politics of Illusion, 5th edition*. New York, NY, USA: Longman
  12. Boykoff MT, Boykoff JM (2004) *Balance as bias: global warming and the US prestige press*. Glob Environ Change **14**: 125-136
  13. Boykoff MT, Boykoff JM (2007) *Climate change and journalistic norms: A case study of U.S. mass-media coverage*. Geoforum (in press)
  14. Carey JW (1989) *Communication as Culture: Essays on Media and Society*. Boston, MA, USA: Unwin Hyman
  15. Carvalho A (2005) *Representing the politics of the greenhouse effect: Discursive strategies in the British media*. Critical Discourse Studies **2**: 1-29
  16. CEI (2006) *We Call it Life*. Washington, DC, USA: Competitive Enterprise Institute
  17. Cowen RC (1957) *Are men changing the earth's weather?* Christian Science Monitor, 4 Dec, p13
  18. Cushman JH (1998) *Industrial group plans to battle climate treaty*. New York Times, 26 Apr, p1
  19. Doyle G (2002) *Media Ownership: The Economics and Politics of Convergence and Concentration in the UK and European Media*. London, UK: Sage Publications
  20. Dunwoody S, Peters HP (1992) *Mass media coverage of technological and environmental risks: A survey of research in the United States and Germany*. Public Underst Sci **1**: 199-230
  21. Entman RM (1993) *Framing: toward clarification of a fractured paradigm*. J Commun **43**: 51-58
  22. Fleming JR (1998) *Historical Perspectives on Climate Change*. Oxford, UK: Oxford University Press
  23. Gelbspan R (1998) *The Heat Is On*. Cambridge, MA, USA: Perseus Books
  24. Grove RH (2003) *Green Imperialism*. Cambridge, UK: Cambridge University Press
  25. Leggett J (2001) *The Carbon War*. New York, NY, USA: Routledge
  26. McChesney RW (1999) *Rich Media, Poor Democracy: Communication Politics in Dubious Times*. Urbana, IL, USA: University of Illinois Press

27. McComas K, Shanahan J (1999) *Telling stories about global climate change: Measuring the impact of narratives on issue cycles*. *Communic Res* **26**: 30-57
28. McCright AM (2007) *Dealing with climate change contrarians*. In Moser SC, Dilling L (eds) *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*, pp 200-212. Cambridge, UK: Cambridge University Press
29. McCright AM, Dunlap RE (2000) *Challenging global warming as a social problem: An analysis of the conservative movement's counter-claims*. *Soc Probl* **47**: 499-522
30. McCright AM, Dunlap RE (2003) *Defeating Kyoto: The conservative movement's impact on U.S. climate change policy*. *Soc Probl* **50**: 348-373
31. Mooney C (2004) *Blinded by science*. *Columbia Journalism Review* 6(Nov/Dec), [www.cjr.org](http://www.cjr.org)
32. NSF (2004) *Science and Engineering Indicators 2004*. Washington, DC, USA: National Science Foundation Project for Excellence in Journalism (2006) *The State of the News Media 2006*. Washington, DC, USA:
33. Project for Excellence in Journalism. [www.stateofthenewsmedia.org](http://www.stateofthenewsmedia.org) Rajan SR (2006) *Modernizing Nature*. Oxford, UK: Oxford University Press
34. Sandell C, Blakemore B (2006) *ABC News reporting cited as evidence in congressional hearing on global warming*. ABC News, 27 Jul, <http://abcnews.go.com>
35. Shabecoff P (1988) *Global warming has begun, expert tells senate*. *New York Times*, 24 Jun, pA1
36. Shrader-Frechette KS (1993) *Burying Uncertainty*. Berkeley, CA, USA: University of California Press
37. Starr P (2004) *The Creation of the Media: Political Origins of Modern Communications*. New York, NY, USA: Basic Books
38. Ungar S (1992) *The rise and (relative) decline of global warming as a social problem*. *Sociol Q* **33**: 483-501
39. Weart SR (2003) *The Discovery of Global Warming*. Cambridge, MA, USA: Harvard University Press
40. Weingart P, Engels A, Pansegrau P (2000) *Risks of communication: Discourses on climate change in science, politics, and the mass media*. *Public Underst Sci* **9**: 261-283
41. Wilkins L (1993) *Between the facts and values: Print media coverage of the greenhouse effect, 1987-1990*. *Public Underst Sci* **2**: 71-84
42. Wilson KM (1995) *Mass media as sources of global warming knowledge*. *Mass Communication Review* **22**: 75-89
43. Wilson KM (2000) *Communicating climate change through the media: Predictions, politics, and perceptions of risks*. In Allan S, Adam B, Carter C (eds) *Environmental Risks and the Media*, pp 201-217. New York, NY, USA: Routledge
44. Zehr SC (2000) *Public representations of scientific uncertainty about global climate change*. *Public Underst Sci* **9**: 85-103
45. O.N. Larsen, ed., *Violence and the Mass Media*, Harper and Row, (1968).
46. R.M.. Liebert et al., *The Early Window: The Effects of Television on Children and Youth*, Pergamon, Elmsford, NY, (1982).

47. G. Noble, *Children in Front of the Small Screen*, Constable, London, (1975).
48. H.J. Schneider, *Das Geschäft mit dem Verbrechen. Massenmedien und Kriminalität*, Kindler, Munich, (1980).
49. W. Schramm, ed., *Grundfragen der Kommunikationsforschung*, Munich, (1973).
50. J.L. Singer and D.G. Singer, *Television, Imagination and Aggression: A Study of Preschoolers*, Erlbaum, Hillsdale, NY, (1981).
51. O.N. Larsen, ed., *Violence and the Mass Media*, Harper and Row, (1968).
52. H.J. Skornia, *Television and Society*, McGraw-Hill, New York, (1965).
53. D.L. Bridgeman, ed., *The Nature of Prosocial Behavior*, New York, Academic Press, (1983).
54. N. Eisenberg, ed., *The Development of Prosocial Behavior*, New York, Academic Press, (1982).
55. W.H. Goodenough, *Cooperation and Change: An Anthropological Approach to Community Development*, New York, Russell Sage Foundation, (1963).
56. J.R. Macauley and L. Berkowitz, *Altruism and Helping Behavior*, Academic Press, New York, (1970).
57. P. Mussen and N. Eisenberg, *Roots of Caring, Sharing and Helping*, Freeman, San Francisco, (1977).
58. J.P. Rushton and R.M. Sorrentino, eds., *Altruism and Helping Behavior*, Erlbaum, Hillsdale, NJ, (1981).
59. L. Wispé, ed., *Altruism, Sympathy and Helping*, Academic Press, New York, (1978).
60. J.-C. Guedon, *La Planète Cyber, Internet et Cyberspace*, Gallimard, (1996).
61. J. Segal, *Théorie de l'information: sciences, techniques et société, de la seconde guerre mondiale à l'aube du XXI siècle*, Thèse de Doctorat, Université Lumière Lyon II, (1998), (<http://www.mpiwg-berlin.mpg.de/staff/segal/thesis/>)
62. H. von Foerster, editor, *Cybernetics - circular, causal and feed-back mechanisms in biological and social systems*. Transactions of sixteenth conferences, Josiah J. Macy Jr. Foundation, New York, (1950- 1954).
63. G. Bateson, *Communication, the Social Matrix of Psychiatry*, Norton, (1951).
64. G. Bateson, *Steps to an Ecology of Mind*, Chandler, San Francisco, (1972).
65. G. Bateson, *Communication et Société*, Seuil, Paris, (1988).
66. R.M. Liebert et al., *The Early Window: The Effects of Television on Children and Youth*, Pergamon, Elmsford, NY, (1982).
67. G. Noble, *Children in Front of the Small Screen*, Constable, London, (1975).
68. W. Schramm, ed., *Grundfragen der Kommunikationsforschung*, Munich, (1973).
69. J.L. Singer and D.G. Singer, *Television, Imagination and Aggression: A Study of Preschoolers*, Erlbaum, Hillsdale, NY, (1981).
70. P. Dasgupta, *Population, Resources and Poverty*, Ambio, **21**, 95-101, (1992).
71. L.R. Brown, *Who Will Feed China?*, W.W. Norton, New York, (1995).
72. L.R. Brown, et al., *Saving the Planet. How to Shape and Environmentally Sustainable Global Economy*, W.W. Norton, New York, (1991).
73. L.R. Brown, *Postmodern Malthus: Are There Too Many of Us to Survive?*, The Washington Post, July 18, (1993).

74. L.R. Brown and H. Kane, *Full House. Reassessing the Earth's Population Carrying Capacity*, W.W. Norton, New York, (1991).
75. L.R. Brown, *Seeds of Change*, Praeger Publishers, New York, (1970).
76. L.R. Brown, *The Worldwide Loss of Cropland*, Worldwatch Paper 24, Worldwatch Institute, Washington, D.C., (1978).
77. L.R. Brown, and J.L. Jacobson, *Our Demographically Divided World*, Worldwatch Paper 74, Worldwatch Institute, Washington D.C., (1986).
78. L.R. Brown, and J.L. Jacobson, *The Future of Urbanization: Facing the Ecological and Economic Constraints*, Worldwatch Paper 77, Worldwatch Institute, Washington D.C., (1987).
79. L.R. Brown, and others, *State of the World*, W.W. Norton, New York, (published annually).
80. H. Brown, *The Human Future Revisited. The World Predicament and Possible Solutions*, W.W. Norton, New York, (1978).
81. H. Hanson, N.E. Borlaug and N.E. Anderson, *Wheat in the Third World*, Westview Press, Boulder, Colorado, (1982).
82. A. Dil, ed., *Norman Borlaug and World Hunger*, Bookservice International, San Diego/Islamabad/Lahore, (1997).
83. N.E. Borlaug, *The Green Revolution Revisited and the Road Ahead*, Norwegian Nobel Institute, Oslo, Norway, (2000).
84. N.E. Borlaug, *Ending World Hunger. The Promise of Biotechnology and the Threat of Antiscience Zealotry*, Plant Physiology, **124**, 487-490, (2000).
85. M. Giampietro and D. Pimental, *The Tightening Conflict: Population, Energy Use and the Ecology of Agriculture*, in *Negative Population Forum*, L. Grant ed., Negative Population Growth, Inc., Teaneck, N.J., (1993).
86. H.W. Kendall and D. Pimental, *Constraints on the Expansion of the Global Food Supply*, Ambio, **23**, 198-2005, (1994).
87. D. Pimental et al., *Natural Resources and Optimum Human Population*, Population and Environment, **15**, 347-369, (1994).
88. D. Pimental et al., *Environmental and Economic Costs of Soil Erosion and Conservation Benefits*, Science, **267**, 1117-1123, (1995).
89. D. Pimental et al., *Natural Resources and Optimum Human Population*, Population and Environment, **15**, 347-369, (1994).
90. D. Pimental and M. Pimental, *Food Energy and Society*, University Press of Colorado, Niwot, Colorado, (1996).
91. D. Pimental et al., *Environmental and Economic Costs of Soil Erosion and Conservation Benefits*, Science, **267**, 1117-1123, (1995).
92. RS and NAS, *The Royal Society and the National Academy of Sciences on Population Growth and Sustainability*, Population and Development Review, **18**, 375-378, (1992).
93. A.M. Altieri, *Agroecology: The Science of Sustainable Agriculture*, Westview Press, Boulder, Colorado, (1995).
94. G. Conway, *The Doubly Green Revolution*, Cornell University Press, (1997).
95. J. Dreze and A. Sen, *Hunger and Public Action*, Oxford University Press, (1991).

96. G. Bridger, and M. de Soissons, *Famine in Retreat?*, Dent, London, (1970).
97. W. Brandt, *World Armament and World Hunger: A Call for Action*, Victor Gollanz Ltd., London, (1982).
98. A.K.M.A. Chowdhury and L.C. Chen, *The Dynamics of Contemporary Famine*, Ford Foundation, Dacca, Pakistan, (1977)
99. J. Shepard, *The Politics of Starvation*, Carnegie Endowment for International Peace, Washington D.C., (1975).
100. M.E. Clark, *Ariadne's Thread: The Search for New Modes of Thinking*, St. Martin's Press, New York, (1989).
101. J.-C. Chesnais, *The Demographic Transition*, Oxford, (1992).
102. C.M. Cipola, *The Economic History of World Population*, Penguin Books Ltd., (1974).
103. E. Draper, *Birth Control in the Modern World*, Penguin Books, Ltd., (1972).
104. Draper Fund Report No. 15, *Towards Smaller Families: The Crucial Role of the Private Sector*, Population Crisis Committee, 1120 Nineteenth Street, N.W., Washington D.C. 20036, (1986).
105. E. Eckholm, *Losing Ground: Environmental Stress and World Food Prospects*, W.W. Norton, New York, (1975).
106. E. Havemann, *Birth Control*, Time-Life Books, (1967).
107. J. Jacobsen, *Promoting Population Stabilization: Incentives for Small Families*, Worldwatch Paper 54, Worldwatch Institute, Washington D.C., (1983).
108. N. Keyfitz, *Applied Mathematical Demography*, Wiley, New York, (1977).
109. W. Latz (ed.), *Future Demographic Trends*, Academic Press, New York, (1979).
110. World Bank, *Poverty and Hunger: Issues and Options for Food Security in Developing Countries*, Washington D.C., (1986).
111. J.E. Cohen, *How Many People Can the Earth Support?*, W.W. Norton, New York, (1995).
112. J. Amos, *Climate Food Crisis to Deepen*, BBC News (5 September, 2005).
113. J. Vidal and T. Ratford, *One in Six Countries Facing Food Shortage*, The Guardian, (30 June, 2005).
114. J. Mann, *Biting the Environment that Feeds Us*, The Washington Post, July 29, 1994.
115. G.R. Lucas, Jr., and T.W. Ogletree, (editors), *Lifeboat Ethics. The Moral Dilemmas of World Hunger*, Harper and Row, New York.
116. J.L. Jacobson, *Gender Bias: Roadblock to Sustainable Development*, Worldwatch Paper 110, Worldwatch Institute, Washington D.C., (1992).
117. J. Gever, R. Kaufmann, D. Skole and C. Vorosmarty, *Beyond Oil: The Threat to Food and Fuel in the Coming Decades*, Ballinger, Cambridge MA, (1986).
118. M. ul Haq, *The Poverty Curtain: Choices for the Third World*, Columbia University Press, New York, (1976).
119. H. Le Bras, *La Planète au Village*, Datar, Paris, (1993).
120. E. Mayr, *Population, Species and Evolution*, Harvard University Press, Cambridge, (1970).

121. Patz, J. A., Campbell-Lendrum, D., Holloway, T. and Foley, J. A. *Impact of regional climate change on human health*. Nature **438**, 310-317 (2005).
122. Basu, R. and Samet, J. M. *Relation between elevated ambient temperature and mortality: a review of the epidemiologic evidence*. Epidemiol. Rev. **24**, 190-202 (2002).
123. Kovats, R. S. and Hajat, S. *Heat stress and public health: a critical review*. Annu. Rev. Publ. Health **29**, 41-55 (2008).
124. Leon, L. R. *Pathophysiology of Heat Stroke* Vol. **7** (Colloquium Series on Integrated Systems Physiology: From Molecule to Function to Disease, Morgan Claypool Life Sciences, 2015).
125. Ostro, B. D., Roth, L. A., Green, R. S. and Basu, R. *Estimating the mortality effect of the July 2006 California heat wave*. Environ. Res. **109**, 614-619 (2009).
126. Glasner, J. et al. *Climate change and the emergent epidemic of CKD from heat stress in rural communities: the case for heat stress nephropathy*. Clin. J. Am. Soc. Nephrol. **11**, 1472-1483 (2016).
127. Robine, J.-M. et al. *Death toll exceeded 70,000 in Europe during the summer of 2003*. C. R. Biol. **331**, 171-178 (2008).
128. Sillmann, J. and Roeckner, E. *Indices for extreme events in projections of anthropogenic climate change*. Climatic Change **86**, 83-104 (2008).
129. Meehl, G. A. and Tebaldi, C. *More intense, more frequent, and longer lasting heat waves in the 21st century*. Science **305**, 994-997 (2004).
130. Orłowsky, B. and Seneviratne, S. *Global changes in extreme events: regional and seasonal dimension*. Climatic Change **110**, 669-696 (2012).
131. Tebaldi, C., Hayhoe, K., Arblaster, J. M. and Meehl, G. A. *Going to the extremes*. Climatic Change **79**, 185-211 (2006).
132. Tebaldi, C. and Wehner, M. F. *Benefits of mitigation for future heat extremes under RCP4.5 compared to RCP8.5*. Climatic Change <http://dx.doi.org/10.1007/s10584-016-1605-5> (2016).
133. Sterl, A. et al. *When can we expect extremely high surface temperatures?* Geophys. Res. Lett. **35**, L14703 (2008).
134. Huang, C. et al. *Projecting future heat-related mortality under climate change scenarios: a systematic review*. Environ. Health Persp. **119**, 1681-1690 (2011).
135. Guo, Y. et al. *Global variation in the effects of ambient temperature on mortality: a systematic evaluation*. J. Epidemiol. **25**, 781-789 (2014).
136. Luber, G. and McGeehin, M. *Climate change and extreme heat events*. Am. J. Prev. Med. **35**, 429-435 (2008).
137. Bouchama, A. and Knochel, J. P. *Heat stroke*. New. Engl. J. Med. **346**, 1978-1988 (2002).
138. Bobb, J. F., Peng, R. D., Bell, M. L. and Dominici, F. *Heat-related mortality and adaptation to heat in the United States*. Environ. Health Persp. **122**, 811-816 (2014).
139. Gasparrini, A. et al. *Temporal variation in heat-mortality associations: a multi-country study*. Environ. Health Persp. **123**, 1200-1207 (2015).

140. Lowe, D., Ebi, K. L. and Forsberg, B. *Heatwave early warning systems and adaptation advice to reduce human health consequences of heatwaves*. Int. J. Environ. Res. Public Health **8**, 4623-4648 (2011).
141. Hanna, E. G. and Tait, P. W. *Limitations to thermoregulation and acclimatization challenge human adaptation to global warming*. Int. J. Environ. Res. Publ. Health. **12**, 8034-8074 (2015).
142. Sherwood, S. C. and Huber, M. *An adaptability limit to climate change due to heat stress*. Proc. Natl Acad. Sci. USA **107**, 9552-9555 (2010).
143. Whitman, S. et al. *Mortality in Chicago attributed to the July 1995 heat wave*. Am. J. Public Health **87**, 1515-1518 (1997).
144. Dousset, B. et al. *Satellite monitoring of summer heat waves in the Paris metropolitan area*. Int. J. Climatol. **31**, 313-323 (2011).
145. Shaposhnikov, D. et al. *Mortality related to air pollution with the Moscow heat wave and wildfire of 2010*. Epidemiology **25**, 359-364 (2014).
146. Barnett, A. G., Tong, S. and Clements, A. *What measure of temperature is the best predictor of mortality?* Environ. Res. **110**, 604-611 (2010).
147. Willett, K. M. and Sherwood, S. *Exceedance of heat index thresholds for 15 regions under a warming climate using the wet-bulb globe temperature*. Int. J. Climatol. **32**, 161-177 (2012).
148. Argüeso, D., Di Luca, A., Perkins-Kirkpatrick, S. and Evans, J. P. *Seasonal mean temperature changes control future heatwaves*. Geophys. Res. Lett. **43**, 7653-7660 (2016).
149. Jones, B. and O'Neill, B. *Spatially explicit global population scenarios consistent with the Shared Socioeconomic Pathways*. Environ. Res. Lett. **11**, 084003 (2016).
150. Diffenbaugh, N. S. and Field, C. B. *Changes in ecologically critical terrestrial climate conditions*. Science **341**, 486-492 (2013).
151. Mitchell, D. et al. *Attributing human mortality during extreme heat waves to anthropogenic climate change*. Environ. Res. Lett. **11**, 074006 (2016).
152. P. Dasgupta, *Population, Resources and Poverty*, Ambio, **21**, 95-101, (1992).
153. L.R. Brown, *Who Will Feed China?*, W.W. Norton, New York, (1995).
154. L.R. Brown, et al., *Saving the Planet. How to Shape and Environmentally Sustainable Global Economy*, W.W. Norton, New York, (1991).
155. L.R. Brown, *Postmodern Malthus: Are There Too Many of Us to Survive?*, The Washington Post, July 18, (1993).
156. L.R. Brown and H. Kane, *Full House. Reassessing the Earth's Population Carrying Capacity*, W.W. Norton, New York, (1991).
157. L.R. Brown, *Seeds of Change*, Praeger Publishers, New York, (1970).
158. L.R. Brown, *The Worldwide Loss of Cropland*, Worldwatch Paper 24, Worldwatch Institute, Washington, D.C., (1978).
159. L.R. Brown, and J.L. Jacobson, *Our Demographically Divided World*, Worldwatch Paper 74, Worldwatch Institute, Washington D.C., (1986).

160. L.R. Brown, and J.L. Jacobson, *The Future of Urbanization: Facing the Ecological and Economic Constraints*, Worldwatch Paper 77, Worldwatch Institute, Washington D.C., (1987).
161. L.R. Brown, and others, *State of the World*, W.W. Norton, New York, (published annually).
162. H. Brown, *The Human Future Revisited. The World Predicament and Possible Solutions*, W.W. Norton, New York, (1978).
163. H. Hanson, N.E. Borlaug and N.E. Anderson, *Wheat in the Third World*, Westview Press, Boulder, Colorado, (1982).
164. A. Dil, ed., *Norman Borlaug and World Hunger*, Bookservice International, San Diego/Islamabad/Lahore, (1997).
165. N.E. Borlaug, *The Green Revolution Revisited and the Road Ahead*, Norwegian Nobel Institute, Oslo, Norway, (2000).
166. N.E. Borlaug, *Ending World Hunger. The Promise of Biotechnology and the Threat of Antiscience Zealotry*, *Plant Physiology*, **124**, 487-490, (2000).
167. M. Giampietro and D. Pimental, *The Tightening Conflict: Population, Energy Use and the Ecology of Agriculture*, in **Negative Population Forum**, L. Grant ed., Negative Population Growth, Inc., Teaneck, N.J., (1993).
168. H.W. Kendall and D. Pimental, *Constraints on the Expansion of the Global Food Supply*, *Ambio*, **23**, 198-2005, (1994).
169. D. Pimental et al., *Natural Resources and Optimum Human Population*, *Population and Environment*, **15**, 347-369, (1994).
170. D. Pimental et al., *Environmental and Economic Costs of Soil Erosion and Conservation Benefits*, *Science*, **267**, 1117-1123, (1995).
171. D. Pimental et al., *Natural Resources and Optimum Human Population*, *Population and Environment*, **15**, 347-369, (1994).
172. D. Pimental and M. Pimental, *Food Energy and Society*, University Press of Colorado, Niwot, Colorado, (1996).
173. D. Pimental et al., *Environmental and Economic Costs of Soil Erosion and Conservation Benefits*, *Science*, **267**, 1117-1123, (1995).
174. RS and NAS, *The Royal Society and the National Academy of Sciences on Population Growth and Sustainability*, *Population and Development Review*, **18**, 375-378, (1992).
175. A.M. Altieri, *Agroecology: The Science of Sustainable Agriculture*, Westview Press, Boulder, Colorado, (1995).
176. G. Conway, *The Doubly Green Revolution*, Cornell University Press, (1997).
177. J. Dreze and A. Sen, *Hunger and Public Action*, Oxford University Press, (1991).
178. G. Bridger, and M. de Soissons, *Famine in Retreat?*, Dent, London, (1970).
179. W. Brandt, *World Armament and World Hunger: A Call for Action*, Victor Gollanz Ltd., London, (1982).
180. A.K.M.A. Chowdhury and L.C. Chen, *The Dynamics of Contemporary Famine*, Ford Foundation, Dacca, Pakistan, (1977).
181. J. Shepard, *The Politics of Starvation*, Carnegie Endowment for International Peace, Washington D.C., (1975).

182. M.E. Clark, *Ariadne's Thread: The Search for New Modes of Thinking*, St. Martin's Press, New York, (1989).
183. C.M. Cipola, *The Economic History of World Population*, Penguin Books Ltd., (1974).
184. E. Draper, *Birth Control in the Modern World*, Penguin Books, Ltd., (1972).
185. Draper Fund Report No. 15, *Towards Smaller Families: The Crucial Role of the Private Sector*, Population Crisis Committee, 1120 Nineteenth Street, N.W., Washington D.C. 20036, (1986).
186. E. Eckholm, *Losing Ground: Environmental Stress and World Food Prospects*, W.W. Norton, New York, (1975).
187. E. Havemann, *Birth Control*, Time-Life Books, (1967).
188. J. Jacobsen, *Promoting Population Stabilization: Incentives for Small Families*, Worldwatch Paper 54, Worldwatch Institute, Washington D.C., (1983).
189. N. Keyfitz, *Applied Mathematical Demography*, Wiley, New York, (1977).
190. W. Latz (ed.), *Future Demographic Trends*, Academic Press, New York, (1979).
191. World Bank, *Poverty and Hunger: Issues and Options for Food Security in Developing Countries*, Washington D.C., (1986).
192. J.E. Cohen, *How Many People Can the Earth Support?*, W.W. Norton, New York, (1995).
193. J. Amos, *Climate Food Crisis to Deepen*, BBC News (5 September, 2005).
194. J. Vidal and T. Ratford, *One in Six Countries Facing Food Shortage*, The Guardian, (30 June, 2005).
195. J. Mann, *Biting the Environment that Feeds Us*, The Washington Post, July 29, 1994.
196. G.R. Lucas, Jr., and T.W. Ogletree, (editors), *Lifeboat Ethics. The Moral Dilemmas of World Hunger*, Harper and Row, New York.
197. J.L. Jacobson, *Gender Bias: Roadblock to Sustainable Development*, Worldwatch Paper 110, Worldwatch Institute, Washington D.C., (1992).
198. J. Gever, R. Kaufmann, D. Skole and C. Vorosmarty, *Beyond Oil: The Threat to Food and Fuel in the Coming Decades*, Ballinger, Cambridge MA, (1986).
199. M. ul Haq, *The Poverty Curtain: Choices for the Third World*, Columbia University Press, New York, (1976).
200. H. Le Bras, *La Planète au Village*, Datar, Paris, (1993).
201. E. Mayr, *Population, Species and Evolution*, Harvard University Press, Cambridge, (1970).
202. N.E. Borlaug, *Ending World Hunger. The Promise of Biotechnology and the Threat of Antiscience Zealotry*, Plant Physiology, **124**, 487-490, (2000).
203. M. Giampietro and D. Pimentel, *The Tightening Conflict: Population, Energy Use and the Ecology of Agriculture*, in *Negative Population Forum*, L. Grant ed., Negative Population Growth, Inc., Teaneck, N.J., (1993).
204. H.W. Kendall and D. Pimentel, *Constraints on the Expansion of the Global Food Supply*, Ambio, **23**, 198-2005, (1994).
205. D. Pimentel et al., *Natural Resources and Optimum Human Population*, Population and Environment, **15**, 347-369, (1994).

206. D. Pimental et al., *Environmental and Economic Costs of Soil Erosion and Conservation Benefits*, Science, **267**, 1117-1123, (1995).
207. RS and NAS, *The Royal Society and the National Academy of Sciences on Population Growth and Sustainability*, Population and Development Review, **18**, 375-378, (1992).
208. A.M. Altieri, *Agroecology: The Science of Sustainable Agriculture*, Westview Press, Boulder, Colorado, (1995).
209. J. Dreze and A. Sen, *Hunger and Public Action*, Oxford University Press, (1991).
210. B. Commoner, *The Closing Circle: Nature, Man and Technology*, Bantam Books, New York, (1972).
211. Council on Environmental Quality and U.S. Department of State, *Global 2000 Report to the President: Entering the Twenty-First Century*, Technical Report, Volume 2, U.S. Government Printing Office, Washington D.C., (1980).
212. A.B. Durning, *Action at the Grassroots: Fighting Poverty and Environmental Decline*, Worldwatch Paper , Worldwatch Institute, Washington D.C., (1989).
213. P. Donaldson, *Worlds Apart: The Economic Gulf Between Nations*, Penguin Books Ltd., (1973).
214. J.C.I. Dooge et al. (editors), *Agenda of Science for Environment and Development into the 21st Century*, Cambridge University Press, (1993).
215. E. Draper, *Birth Control in the Modern World*, Penguin Books, Ltd., (1972).
216. Draper Fund Report No. 15, *Towards Smaller Families: The Crucial Role of the Private Sector*, Population Crisis Committee, 1120 Nineteenth Street, N.W., Washington D.C. 20036, (1986).
217. Economic Commission for Europe, *Air Pollution Across Boundaries*, United Nations, New York, (1985).
218. A.H. Ehrlich and U. Lele, *Humankind at the Crossroads: Building a Sustainable Food System*, in *Draft Report of the Pugwash Study Group: The World at the Crossroads*, Berlin, (1992).
219. P.R. Ehrlich, *The Population Bomb*, Sierra/Ballentine, New York, (1972).
220. P.R. Ehrlich, A.H. Ehrlich and J. Holdren, *Human Ecology*, W.H. Freeman, San Francisco, (1972).
221. P.R. Ehrlich, A.H. Ehrlich and J. Holdren, *Ecoscience: Population, Resources, Environment*, W.H. Freeman, San Francisco, (1977).
222. P.R. Ehrlich and A.H. Ehrlich, *Extinction*, Victor Gollancz, London, (1982).
223. P.R. Ehrlich and A.H. Ehrlich, *Healing the Planet*, Addison Wesley, Reading MA, (1991).
224. P.R. Ehrlich and A.H. Ehrlich, *The Population Explosion*, Arrow Books, (1991).
225. I. Eibl-Eibesfeldt, *The Biology of War and Peace*, Thames and Hudson, New York, (1979).
226. Food and Agricultural Organization, *The State of Food and Agriculture*, United Nations, Rome, (published annually).
227. K. Griffin, *Land Concentration and Rural Poverty*, Holmes and Meyer, New York, (1976).

228. G. Hagman and others, *Prevention is Better Than Cure*, Report on Human Environmental Disasters in the Third World, Swedish Red Cross, Stockholm, Stockholm, (1986).
229. M. ul Haq, *The Poverty Curtain: Choices for the Third World*, Columbia University Press, New York, (1976).
230. E. Mayr, *Population, Species and Evolution*, Harvard University Press, Cambridge, (1970).
231. N. Myers, *The Sinking Ark*, Pergamon, New York, (1972).
232. N. Myers, *Conservation of Tropical Moist Forests*, National Academy of Sciences, Washington D.C., (1980).
233. K. Newland, *Infant Mortality and the Health of Societies*, Worldwatch Paper 47, Worldwatch Institute, Washington D.C., (1981).
234. W. Ophuls, *Ecology and the Politics of Scarcity*, W.H. Freeman, San Francisco, (1977).
235. D.W. Orr, *Ecological Literacy*, State University of New York Press, Albany, (1992).
236. A. Peccei, *The Human Quality*, Pergamon Press, Oxford, (1977).
237. A. Peccei, *One Hundred Pages for the Future*, Pergamon Press, New York, (1977).
238. A. Peccei and D. Ikeda, *Before it is Too Late*, Kodansha International, Tokyo, (1984).
239. E. Pestel, *Beyond the Limits to Growth*, Universe Books, New York, (1989).
240. Bonan, G. B. (2008). *Forests and climate change: Forcings, feedbacks, and the climate benefits of forests*. *Science*. **320** (5882): 1444-1449.
241. Scheil, D.; Murdiyarso, D. (2009). *How Forests Attract Rain: An Examination of a New Hypothesis*. *BioScience*. **59** (4): 341-347.
242. Ahmad, Y.J. and M. Kassas. 1987. *Desertification: Financial Support for the Biosphere*. West Hartford, Conn.: Kumarian Press.
243. Barrow, C. J. 1991. *Land Degradation - Developments and Breakdown of Terrestrial Environments*. Cambridge: Cambridge University Press.
244. Gadgil, M. 1989. *Deforestation: Problems and prospects*. Foundation Day Lecture, Society for Promotion of Wastelands Development, 12 May, New Delhi. Centre of Ecological Sciences and Theoretical Studies, Indian Institute of Science Bangalore.
245. Government of India. 1987. *State of Forest Report 1987*. Forest Survey of India, Dehradun.
246. Government of India. 1991. *State of Forest Report, 1987-1989*. Forest Survey of India, Dehradun.
247. Kassas, M. 1987. *Drought and desertification*. *Land Use Policy* **4**(4): 389-400.
248. Kemp, D. D. 1990. *Global Environmental Issues - A Climatological Approach*. London: Routledge.
249. Maheshwari, J. K. 1989. *Processing and Utilization of Perennial Vegetation in the Arid Zone of India* in **Role of Forestry in Combatting Desertification**. Rome: FAO Conservation Guide 21, pp. 137-172.
250. Reining, P. 1978. *Handbook on Desertification Indicators*. Washington, D.C.: American Association for the Advancement of Science.

251. Tolba, M. K. 1987. *Sustainable Development: Constraints and Opportunities* London: Butterworth.
252. Tolba, M. K., O. A. El-Kholy, et al. 1992. *The World Environment 1972-1992. Two Decades of Challenge*. London: Chapman and Hall.
253. Tucker, C. J., H. E. Dregne, and W. W. Newcomb. 1991. *Expansion and contraction of Sahara Desert from 1980-1990*. Science **253**.
254. UNCED (United Nations Conference on Environment and Development). 1992. *Agenda 21*. United Nations Conference on Environment and Development, Brazil, June 3-14,1992. Brazil: UNCED.
255. UNEP (United Nations Environment Programme). 1984. *General Assessment of Progress in the Implementation of the Plan of Action to Combat Desertification, 1978-1984*. GC-12/9.
256. UNEP (United Nations Environment Programme). 1991. *Status of Desertification and Implementation of the United Nations Plan of Action to Control Desertification*. Nairobi: UNEP.
257. Winpenny, J. T. (ed.). 1990. *Development Research: The Environmental Challenge*. Boulder, Colo.: Westview Press, for the ODI.
258. Wood, W. B. 1990. *Tropical Deforestation. Balancing Regional Development Demands and Global Environmental Concerns*.
259. World Bank. 1992. *World Development Report 1992*. Oxford: Oxford University Press.

# Chapter 2

## SAINT FRANCIS

### 2.1 The life of Saint Francis

Saint Francis of Assisi was born in 1181 in the Italian hilltop town of Assisi. His father, Pietro di Bernardone, was a prosperous silk merchant, and his mother Pica de Bourlemont, was a noblewoman from Provence. Saint Francis was originally called Giovanni, but his father later renamed him Francesco because of his successful business dealings in France and his admiration for all things French.

After leading the ordinary (somewhat dissolute) life of a wealthy young man of that period, Saint Francis underwent a religious conversion, following which he renounced his inheritance and embraced a life of poverty. Although not ordained as a priest, he began teaching what he believed to be the true Christian message. He soon acquired a small group of followers, and he traveled with them to Rome to ask Pope Innocent III for permission to found a new religious order. During his life, Saint Francis founded three religious orders.

Saint Francis continued to preach, and is even said to have preached to birds and animals, whom he regarded as his sisters and brothers. His attitude towards nature can be seen in his “Canticle of the Sun”:

The reverence for all life, and even for inanimate nature, shown by Saint Francis is similar to that of indigenous peoples. We see it in the words of Luther Standing Bear quoted in Chapter 1. Later Albert Schweitzer’s writings emphasized Reverence for Life as an ethical principle. For example, Albert Schweitzer wrote: “We must fight against the spirit of unconscious cruelty with which we treat the animals. Animals suffer as much as we do. True humanity does not allow us to impose such sufferings on them. It is our duty to make the whole world recognize it. Until we extend our circle of compassion to all living things, humanity will not find peace.”



Figure 2.1: Saint Francis preaching to the birds in a painting by Giotto.

## 2.2 *Canticle of the Sun*

*Most High, all powerful, good Lord,  
Yours are the praises, the glory, the honor,  
and all blessing.*

*To You alone, Most High, do they belong,  
and no man is worthy to mention Your name.*

*Be praised, my Lord, through all your creatures,  
especially through my lord Brother Sun,  
who brings the day; and you give light through him.  
And he is beautiful and radiant in all his splendor!  
Of you, Most High, he bears the likeness.*

*Praise be You, my Lord, through Sister Moon  
and the stars, in heaven you formed them  
clear and precious and beautiful.*

*Praised be You, my Lord, through Brother Wind,  
and through the air, cloudy and serene,  
and every kind of weather through which  
You give sustenance to Your creatures.*

*Praised be You, my Lord, through Sister Water,  
which is very useful and humble and precious and chaste.*

*Praised be You, my Lord, through Brother Fire,  
through whom you light the night and he is beautiful  
and playful and robust and strong.*

*Praised be You, my Lord, through Sister Mother Earth,  
who sustains us and governs us and who produces  
varied fruits with colored flowers and herbs.*

*Praised be You, my Lord,  
through those who give pardon for Your love,  
and bear infirmity and tribulation.*

*Blessed are those who endure in peace  
for by You, Most High, they shall be crowned.*

*Praised be You, my Lord,*

*through our Sister Bodily Death,  
from whom no living man can escape.*

*Woe to those who die in mortal sin.  
Blessed are those whom death will  
find in Your most holy will,  
for the second death shall do them no harm.*

*Praise and bless my Lord,  
and give Him thanks  
and serve Him with great humility.*

## 2.3 Canonization

Pope Gregory IX canonized Francis on 16 July 1228. Along with Saint Catherine of Sienna, he was designated Patron Saint of Italy. He later became associated with patronage of animals and the natural environment, and it became customary for Catholic and Anglican churches to hold ceremonies blessing animals on his feast day of 4 October.

## 2.4 *A prayer of Saint Francis*

*Blessed is he who loves and does not therefore desire to be loved;  
Blessed is he who fears and does not therefore desire to be feared;  
Blessed is he who serves and does not therefore desire to be served;  
Blessed is he who behaves well toward others and does not desire that others behave well  
toward him;*

### A few more things that Saint Francis said

All the darkness in the world cannot extinguish the light of a single candle.

Lord, make me an instrument of thy peace.  
Where there is hatred, let me sow love,  
Where there is injury, pardon;  
Where there is doubt, faith;  
Where there is despair, hope;  
Where there is darkness, light;  
And where there is sadness, joy.

O Divine Master, grant that I may not so much seek  
to be consoled as to console,

to be understood as to understand,  
to be loved, as to love.

For it is in giving that we receive,  
It is in pardoning that we are pardoned,  
and it is in dying that we are born to eternal life.

Start by doing what is necessary, then what is possible, and suddenly you are doing the impossible.

He who works with his hands is a laborer.  
He who works with his hands and his head is a craftsman.  
He who works with his hands and his head and his heart is an artist.

For it is in giving that we receive.

The deeds you do may be the only sermon some persons will hear today.

Remember that when you leave this earth, you can take with you nothing that have received—only what you have given.

I have been all things unholy. If God can work through me, He can work through anyone.

If you have men who will exclude any of God's creatures from the shelter of compassion and pity, you will have men who will deal likewise with their fellow men.

While you are proclaiming peace with your lips, be careful to have it even more fully in your heart.

We have been called to heal wounds, to unite what has fallen apart, and to bring home those who have lost their way.

True progress quietly and persistently moves along without notice.

A single sunbeam is enough to drive away many shadows.

No one is to be called an enemy, all are your benefactors, and no one does you harm. You have no enemy except yourselves.

Above all the grace and the gifts that Christ gives to his beloved is that of overcoming self.



My dear and beloved Brother, the treasure of blessed poverty is so very precious and divine that we are not worthy to possess it in our vile bodies. For poverty is that heavenly virtue by which all earthy and transitory things are trodden under foot, and by which every obstacle is removed from the soul so that it may freely enter into union with the eternal Lord God. It is also the virtue which makes the soul, while still here on earth, converse with the angels in Heaven. It is she who accompanied Christ on the Cross, was buried with Christ in the Tomb, and with Christ was raised and ascended into Heaven, for even in this life she gives to souls who love her the ability to fly to Heaven, and she alone guards the armor of true humility and charity.



Figure 2.2: Another paintings of Saint Francis.



Figure 2.3: Saint Claire of Assisi, who worked together with Saint Francis.



Figure 2.4: The Pope approving the statutes of the Order of the Franciscans, by Giotto.



Figure 2.5: The Basilica of Saint Francis at Assisi. The frescos inside the cathedral, by Giotto and his students, were destroyed by an earthquake not long ago, but fortunately it proved to be possible to reassemble the fragments by means of a computer program.



Figure 2.6: A garden statue of St. Francis.

## Films about St. Francis

- The Flowers of St. Francis, a 1950 film directed by Roberto Rossellini and co-written by Federico Fellini
- Francis of Assisi, a 1961 film directed by Michael Curtiz, based on the novel The Joyful Beggar by Louis de Wohl
- Francis of Assisi, a 1966 film directed by Liliana Cavani
- Uccellacci e uccellini (The Hawks and the Sparrows), a 1966 film directed by Pier Paolo Pasolini
- Brother Sun, Sister Moon, a 1972 film by Franco Zeffirelli
- Francesco, a 1989 film by Liliana Cavani, contemplatively paced, follows Francis of Assisi's evolution from rich man's son to religious humanitarian, and eventually to full-fledged self-tortured saint. Saint Francis is played by Mickey Rourke, and the woman who later became Saint Clare, is played by Helena Bonham Carter
- St. Francis, a 2002 film directed by Michele Soavi, starring Raoul Bova and Amélie Daure
- Clare and Francis, a 2007 film directed by Fabrizio Costa, starring Mary Petruolo and Ettore Bassi
- Pranchiyettan and the Saint, a 2010 satirical Indian Malayalam film
- Finding Saint Francis, a 2014 film directed by Paul Alexander
- L'ami - Francois d'Assise et ses frères, a 2016 film directed by Renaud Fely and Arnaud Louvet, starring Elio Germano
- The Sultan and the Saint, a 2016 film directed by Alexander Kronemer, starring Alexander McPherson
- In Search of Saint Francis of Assisi Documentary featuring Franciscan monks and others.

## Musical works about St. Francis

- Franz Liszt: Cantico del sol di Francesco d'Assisi, S.4 (sacred choral work, 1862, 1880-81; versions of the Prelude for piano, S. 498c, 499, 499a; version of the Prelude for organ, S. 665, 760; version of the Hosannah for organ and bass trombone, S.677)
- Franz Liszt: St. Francois d'Assise: La Prédication aux oiseaux, No. 1 of Deux Légendes, S.175 (piano, 1862-63)
- William Henry Draper: All Creatures of Our God and King (hymn paraphrase of Canticle of the Sun, published 1919)
- Mario Castelnuovo-Tedesco: Fioretti (voice and orchestra, 1920)
- Gian Francesco Malipiero: San Francesco d'Assisi (soloists, chorus and orchestra, 1920-21)
- Hermann Suter: Le Laudi (The Praises) or Le Laudi di San Francesco d'Assisi, based on the Canticle of the Sun, (oratorio, 1923)
- Amy Beach: Canticle of the Sun (soloists, chorus and orchestra, 1928)
- Paul Hindemith: Nobilissima Visione (ballet 1938)

- Leo Sowerby: *Canticle of the Sun* (cantata for mixed voices with accompaniment for piano or orchestra, 1944)
- Francis Poulenc: *Quatre petites prières de saint Francois d'Assise* (men's chorus, 1948)
- Seth Bingham: *The Canticle of the Sun* (cantata for chorus of mixed voices with soli ad lib. and accompaniment for organ or orchestra, 1949)
- William Walton: *Cantico del sol* (chorus, 1973-74)
- Olivier Messiaen: *Saint Francois d'Assise* (opera, 1975-83)
- Peter Janssens: *Franz von Assisi, Musikspiel* (Musical play, text: Wilhelm Wilms, 1978)
- Michele Paulicelli: *Forza venite gente [it]* (musical theater, 1981)
- Karlheinz Stockhausen: *Luzifers Abschied* (1982), scene 4 of the opera *Samstag aus Licht*
- Libby Larsen: *I Will Sing and Raise a Psalm* (SATB chorus and organ, 1995)
- Sofia Gubaidulina: *Sonnengesang* (solo cello, chamber choir and percussion, 1997)
- Juventude Franciscana [pt]: *Balada de Francisco* (voices accompanied by guitar, 1999)
- Angelo Branduardi : *L'infinitamente piccolo* (album, 2000)
- Lewis Nielson: *St. Francis Preaches to the Birds* (chamber concerto for violin, 2005)
- Peter Reulein (composer) / Helmut Schlegel (libretto): *Laudato si'* (oratorio, 2016)

## Suggestions for further reading

1. Francis of Assisi, *The Little Flowers* (fioretti), London, 2012.
2. Saint Francis of Assisi, written and illustrated by Demi, *Wisdom Tales*, 2012.
3. Francis of Assisi: *A New Biography*, by Augustine Thompson, O.P., Cornell University Press, 2012.
4. Francis of Assisi in the Sources and Writings, by Robert Rusconi and translated by Nancy Celaschi, *Franciscan Institute Publications*, 2008.
5. *The Complete Francis of Assisi: His Life, The Complete Writings, and The Little Flowers*, ed. and trans. Jon M. Sweeney, *Paraclete Press*, 2015.
6. *The Stigmata of Francis of Assisi*, *Franciscan Institute Publications*, 2006.
7. *Francis of Assisi - The Message in His Writings*, by Thaddee Matura, *Franciscan Institute Publications*, 1997.
8. *Saint Francis of Assisi*, by John R. H. Moorman, *Franciscan Institute Publications*, 1987.
9. *First Encounter with Francis of Assisi*, by Damien Vorreux and translated by Paul LaChance, *Franciscan Institute Publications*, 1979.
10. *St. Francis of Assisi*, by Raoul Manselli, *Franciscan Institute Publications*, 1985.
11. *Saint Francis of Assisi*, by Thomas of Celano and translated by Placid Hermann, *Franciscan Institute Publications*, 1988.
12. *Francis the Incomparable Saint*, by Joseph Lortz, *Franciscan Institute Publications*, 1986.

13. Respectfully Yours: Signed and Sealed, Francis of Assisi, by Edith van den Goorbergh and Theodore Zweerman, Franciscan Institute Publications, 2001.
14. The Admonitions of St. Francis: Sources and Meanings, by Robert J. Karris, Franciscan Institute Publications, 1999.
15. We Saw Brother Francis, by Francis de Beer, Franciscan Institute Publications, 1983.



# Chapter 3

## HENRY DAVID THOREAU

In the distant future (and perhaps even in the not-so-distant future) industrial civilization will need to abandon its relentless pursuit of unnecessary material goods and economic growth. Modern society will need to re-establish a balanced and harmonious relationship with nature. In preindustrial societies harmony with nature is usually a part of the cultural tradition. In our own time, the same principle has become central to the ecological counter-culture while the main-stream culture thunders blindly ahead, addicted to wealth, power and growth.

In the 19th century the American writer, Henry David Thoreau (1817-1862), pioneered the concept of a simple life, in harmony with nature. Today, his classic book, *Walden*, has become a symbol for the principles of ecology, simplicity, and respect for nature.

Thoreau was born in Concord Massachusetts, and he attended Harvard from 1833 to 1837. After graduation, he returned home, worked in his family's pencil factory, did odd jobs, and for three years taught in a progressive school founded by himself and his older brother, John. When John died of lockjaw in 1842, Henry David was so saddened that he felt unable to continue the school alone.

### Nonviolent civil disobedience

Thoreau refused to pay his poll tax because of his opposition to the Mexican War and to the institution of slavery. Because of his refusal to pay the tax (which was in fact a very small amount) he spent a night in prison. To Thoreau's irritation, his family paid the poll tax for him and he was released. He then wrote down his ideas on the subject in an essay entitled *The Duty of Civil Disobedience*, where he maintains that each person has a duty to follow his own individual conscience even when it conflicts with the orders of his government.

In his essay, Thoreau said: "A common and natural result of an undue respect for law is that you may see a file of soldiers, colonel, captain, corporal, privates, powder-monkeys, and all marching in admirable order over hill and dale to the wars, against their wills, ay, against their common sense and consciences, which makes it very steep marching indeed, and produces a palpitation of the heart. They have no doubt that it is a damnable business

in which they are concerned; they are all peaceably inclined. Now, what are they? Men at all? or small movable forts and magazines, at the service of some unscrupulous man in power?"

"Under a government that which imprisons any unjustly", Thoreau wrote, "the true place for a just man is in prison." Civil Disobedience influenced Tolstoy, Gandhi and Martin Luther King, and it anticipated the Nuremberg Principles.

### 3.1 Harmony with nature

Thoreau became the friend and companion of the transcendentalist writer Ralph Waldo Emerson (1803 1882), who introduced him to a circle of New England writers and thinkers that included Ellery Channing, Margaret Fuller and Nathaniel Hawthorne.

Nathaniel Hawthorne described Thoreau in the following words: "Mr. Thorow [sic] is a keen and delicate observer of nature, a genuine observer, which, I suspect, is almost as rare a character as even an original poet; and Nature, in return for his love, seems to adopt him as her especial child, and shows him secrets which few others are allowed to witness. He is familiar with beast, fish, fowl, and reptile, and has strange stories to tell of adventures, and friendly passages with these lower brethren of mortality. Herb and flower, likewise, wherever they grow, whether in garden, or wild wood, are his familiar friends. He is also on intimate terms with the clouds and can tell the portents of storms. It is a characteristic trait, that he has a great regard for the memory of the Indian tribes, whose wild life would have suited him so well; and strange to say, he seldom walks over a plowed field without picking up an arrow-point, a spear-head, or other relic of the red men, as if their spirits willed him to be the inheritor of their simple wealth."

### Walden, an experiment in simple living

At Emerson's suggestion, Thoreau opened a journal, in which he recorded his observations concerning nature and his other thoughts. Ultimately the journal contained more than 2 million words. Thoreau drew on his journal when writing his books and essays, and in recent years, many previously unpublished parts of his journal have been printed.

From 1845 until 1847, Thoreau lived in a tiny cabin that he built with his own hands. The cabin was in a second-growth forest beside Walden Pond in Concord, on land that belonged to Emerson. Thoreau regarded his life there as an experiment in simple living. He described his life in the forest and his reasons for being there in his book *Walden*,

"Most of the luxuries", Thoreau wrote, "and many of the so-called comforts of life, are not only not indispensable, but positive hindrances to the elevation of mankind. With respect to luxuries, the wisest have ever lived a more simple and meager life than the poor. The ancient philosophers, Chinese, Hindoo, Persian, and Greek, were a class than which none has been poorer in outward riches, none so rich in inward."

Elsewhere in "Walden", Thoreau remarks, "It is never too late to give up your prejudices", and he also says, "Why should we be in such desperate haste to succeed, and in



Figure 3.1: Henry David Thoreau (1817-1862). Daguerreotype by Benjamin D. Maxham, 1856).

such desperate enterprises? If a man does not keep pace with his companions, perhaps it is because he hears a different drummer.” Other favorite quotations from Thoreau include “Rather than love, than money, than fame, give me truth”, “Beware of all enterprises that require new clothes”, “Most men lead lives of quiet desperation” and “Men have become tools of their tools.”

Thoreau’s closeness to nature can be seen from the following passage, written by his friend Frederick Willis, who visited him at Walden Pond in 1847, together with the Alcott family: “He was talking to Mr. Alcott of the wild flowers in Walden woods when, suddenly stopping, he said: ‘Keep very still and I will show you my family.’ Stepping quickly outside the cabin door, he gave a low and curious whistle; immediately a woodchuck came running towards him from a nearby burrow. With varying note, yet still low and strange, a pair of gray squirrels were summoned and approached him fearlessly. With still another note several birds, including two crows flew towards him, one of the crows nestling upon his shoulder. I remember that it was the crow resting close to his head that made the most vivid impression on me, knowing how fearful of man this bird is. He fed them all from his hand, taking food from his pocket, and petted them gently before our delighted gaze; and then dismissed them by different whistling, always strange and low and short, each wild thing departing instantly at hearing his special signal.”

## **Thoreau’s views on religion**

Towards the end of his life, when he was very ill, someone asked Thoreau whether he had made his peace with God. “We never quarreled”, he answered.

In an essay published by the Atlantic Monthly in 1853, Thoreau described a pine tree in Maine with the words: “It is as immortal as I am, and perchance will go to as high a heaven, there to tower above me still.” However, the editor (James Russell Lowell) considered the sentence to be blasphemous, and removed it from Thoreau’s essay.

In one of his essays, Thoreau wrote: “If a man walk in the woods for love of them half of each day, he is in danger of being regarded as a loafer; but if he spends his whole day as a speculator, shearing off those woods and making the earth bald before her time, he is esteemed an industrious and enterprising citizen.”

## **A few more things that Thoreau said**

**It is the beauty within us that makes it possible for us to recognize the beauty around us. The question is not what you look at, but what you see.**

**Simplify your life. Don’t waste the years struggling for things that are unimportant. Don’t burden yourself with possessions. Keep your needs and wants simple and enjoy what you have. Don’t destroy your peace of mind by looking back, worrying about the past. Live in the present. Simplify!**

Go confidently in the direction of your dreams. Live the life you've imagined.

Happiness is like a butterfly; the more you chase it, the more it will elude you, but if you turn your attention to other things, it will come and sit softly on your shoulder.

You must live in the present, launch yourself on every wave, find your eternity in each moment. Fools stand on their island of opportunities and look toward another land. There is no other land; there is no other life but this

Be not simply good, be good for something,

Books are the treasured wealth of the world and the fit inheritance of generations and nations.

If you have built castles in the air, your work need not be lost; that is where they should be. Now put the foundations under them.

If a man does not keep pace with his companions, perhaps it is because he hears a different drummer. Let him step to the music he hears, however measured or far away.

The greatest compliment that was ever paid me was when one asked me what I thought, and attended to my answer.

We need the tonic of wildness...At the same time that we are earnest to explore and learn all things, we require that all things be mysterious and unexplorable, that land and sea be indefinitely wild, unsurveyed and unfathomed by us because unfathomable. We can never have enough of nature.

I see young men, my townsmen, whose misfortune it is to have inherited farms, houses, barns, cattle, and farming tools; for these are more easily acquired than got rid of. Better if they had been born in the open pasture and suckled by a wolf, that they might have seen with clearer eyes what field they were called to labor in.

A man is rich in proportion to the number of things which he can afford to let alone.

The man who goes alone can start today; but he who travels with another must wait till that other is ready

I would not have any one adopt my mode of living on any account; for, beside

that before he has fairly learned it I may have found out another for myself, I desire that there may be as many different persons in the world as possible; but I would have each one be very careful to find out and pursue his own way, and not his father's or his mother's or his neighbor's instead. The youth may build or plant or sail, only let him not be hindered from doing that which he tells me he would like to do. It is by a mathematical point only that we are wise, as the sailor or the fugitive slave keeps the polestar in his eye; but that is sufficient guidance for all our life. We may not arrive at our port within a calculable period, but we would preserve the true course.

Be a Columbus to whole new continents and worlds within you, opening new channels, not of trade, but of thought.

I never found the companion that was so companionable as solitude.

For more than five years I maintained myself thus solely by the labor of my hands, and I found, that by working about six weeks in a year, I could meet all the expenses of living. The whole of my winters, as well as most of my summers, I had free and clear for study.

Perhaps we are led oftener by the love of novelty, and a regard for the opinions of men, in procuring it, than by a true utility.

Our inventions are wont to be pretty toys, which distract our attention from serious things. They are but improved means to an unimproved end, an end which it was already but too easy to arrive at; as railroads lead to Boston or New York. We are in great haste to construct a magnetic telegraph from Maine to Texas; but Maine and Texas, it may be, have nothing important to communicate.

The grass flames up on the hillsides like a spring fire,—“*et primitus oritur herba imbribus primoribus evocata*,”—as if the earth sent forth an inward heat to greet the returning sun; not yellow but green is the color of its flame;—the symbol of perpetual youth, the grass-blade, like a long green ribbon, streams from the sod into the summer, checked indeed by the frost, but anon pushing on again, lifting its spear of last year's hay with the fresh life below.... So our human life but dies down to its root, and still puts forth its green blade to eternity.

I sometimes wonder that we can be so frivolous, I may almost say, as to attend to the gross but somewhat foreign form of servitude called Negro Slavery, there are so many keen and subtle masters that enslave both north and south. It is hard to have a southern overseer; it is worse to have a northern one; but worst of all when you are the slave-driver of yourself.

I learned this, at least, by my experiment: that if one advances confidently in the direction of his dreams, and endeavors to live the life which he has imagined, he will meet with a success unexpected in common hours.

Books are the treasured wealth of the world and the fit inheritance of generations and nations.

We need the tonic of wildness...At the same time that we are earnest to explore and learn all things, we require that all things be mysterious and unexplorable, that land and sea be indefinitely wild, unsurveyed and unfathomed by us because unfathomable. We can never have enough of nature.

Live in each season as it passes; breathe the air, drink the drink, taste the fruit, and resign yourself to the influence of the earth.

However mean your life is, meet it and live it; do not shun it and call it hard names. It is not so bad as you are. It looks poorest when you are richest. The fault-finder will find faults even in paradise. Love your life, poor as it is. You may perhaps have some pleasant, thrilling, glorious hours, even in a poorhouse. The setting sun is reflected from the windows of the almshouse as brightly as from the rich man's abode; the snow melts before its door as early in the spring. I do not see but a quiet mind may live as contentedly there, and have as cheering thoughts, as in a palace.

As if you could kill time without injuring eternity.

Heaven is under our feet as well as over our heads.

Every generation laughs at the old fashions, but follows religiously the new.

I went to the woods because I wished to live deliberately, to front only the essential facts of life, and see if I could not learn what it had to teach, and not, when I came to die, discover that I had not lived.

The mass of men lead lives of quiet desperation. What is called resignation is confirmed desperation. From the desperate city you go into the desperate country, and have to console yourself with the bravery of minks and muskrats. A stereotyped but unconscious despair is concealed even under what are called the games and amusements of mankind. There is no play in them, for this comes after work. But it is a characteristic of wisdom not to do desperate things.

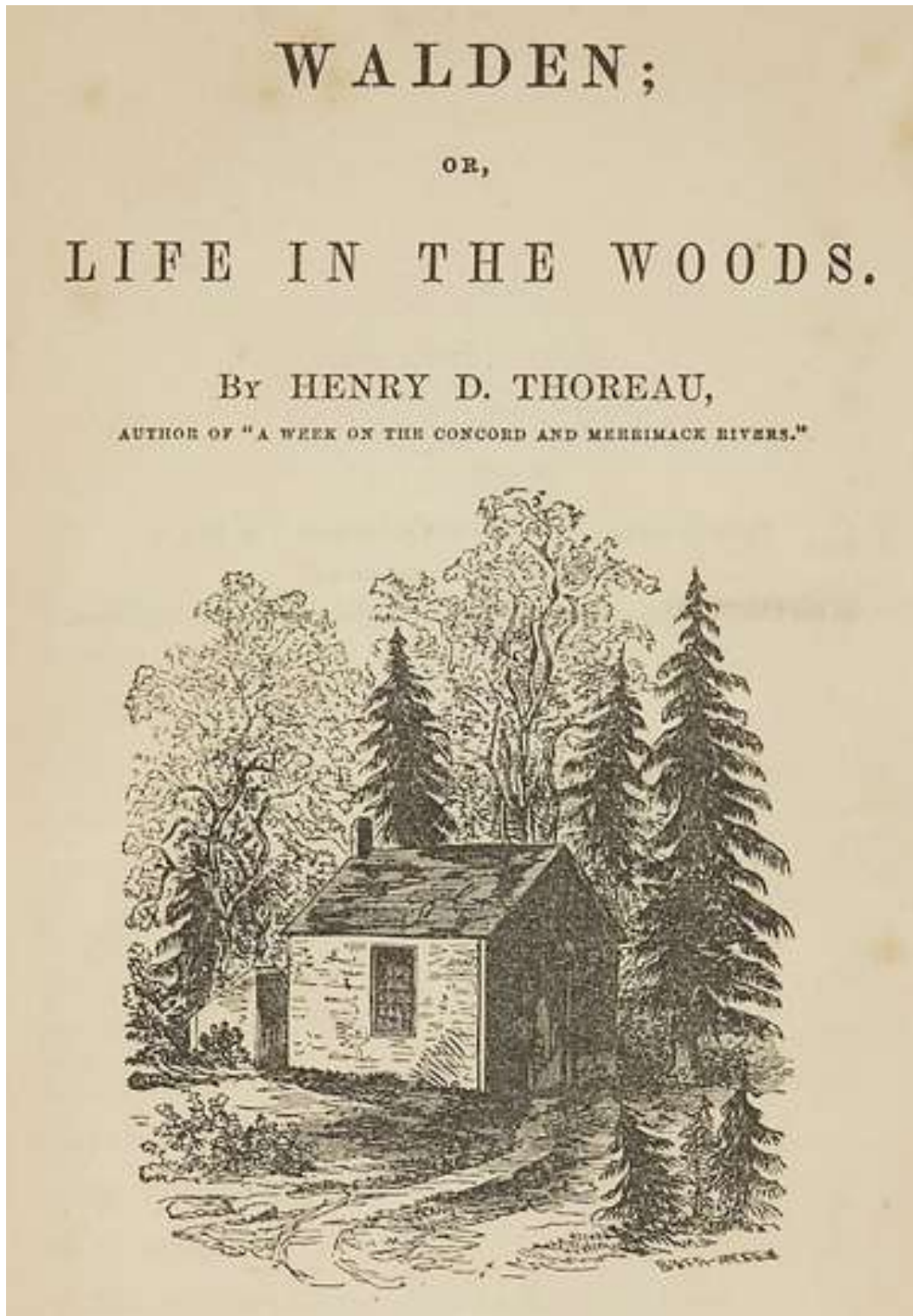


Figure 3.2: The frontpiece of Thoreau's book, *Walden*.



Figure 3.3: A portrait of Ralph Waldo Emerson by Eastman Johnson, 1856. Expressing ideas that he would later develop in his famous essay *Nature*, Emerson wrote, “Nature is a language and every new fact one learns is a new word; but it is not a language taken to pieces and dead in the dictionary, but the language put together into a most significant and universal sense. I wish to learn this language, not that I may know a new grammar, but that I may read the great book that is written in that tongue.”



Figure 3.4: Walden Pond, as it looks today. The small cabin which Thoreau built with his own hands was near to the pond. Today Walden has become a place of pilgrimage for the environmental movement. Thoreau's complete *Journals*, which are in fact his major work, have today been published. They contain roughly seven thousand pages, and two million words.

## 3.2 On the Duty of Civil Disobedience

Here are a few quotations from Thoreau's essay:

Let every man make known what kind of government would command his respect, and that will be one step toward obtaining it.

After all, the practical reason why, when the power is once in the hands of the people, a majority are permitted, and for a long period continue, to rule, is not because they are most likely to be in the right, nor because this seems fairest to the minority, but because they are physically the strongest. But a government in which the majority rule in all cases can not be based on justice, even as far as men understand it. Can there not be a government in which the majorities do not virtually decide right and wrong, but conscience? - in which majorities decide only those questions to which the rule of expediency is applicable? Must the citizen ever for a moment, or in the least degree, resign his conscience to the legislator? Why has every man a conscience, then? I think that we should be men first, and subjects afterward. It is not desirable to cultivate a respect for the law, so much as for the right. The only obligation which I have a right to assume, is to do at any time what I think right. It is truly enough said that a corporation has no conscience; but a corporation of conscientious men is a corporation with a conscience. Law never made men a whit more just; and, by means of their respect for it, even the well-disposed are daily made the agents of injustice. A common and natural result of an undue respect for the law is, that you may see a file of soldiers, colonel, captain, corporal, privates, powder-monkeys and all, marching in admirable order over hill and dale to the wars, against their wills, aye, against their common sense and consciences, which makes it very steep marching indeed, and produces a palpitation of the heart. They have no doubt that it is a damnable business in which they are concerned; they are all peaceably inclined. Now, what are they? Men at all? or small movable forts and magazines, at the service of some unscrupulous man in power? Visit the Navy Yard, and behold a marine, such a man as an American government can make, or such as it can make a man with its black arts, a mere shadow and reminiscence of humanity, a man laid out alive and standing, and already, as one may say, buried under arms with funeral accompaniment, though it may be...

Unjust laws exist: shall we be content to obey them, or shall we endeavor to amend them, and obey them until we have succeeded, or shall we transgress them at once? Men generally, under such a government as this, think that they ought to wait until they have persuaded the majority to alter them. They think that, if they should resist, the remedy would be worse than the evil. But it is the fault of the government itself that the remedy is worse than the evil.

It makes it worse. Why is it not more apt to anticipate and provide for reform? Why does it not cherish its wise minority? Why does it cry and resist before it is hurt? Why does it not encourage its citizens to be on the alert to point out its faults, and do better than it would have them? Why does it always crucify Christ, and excommunicate Copernicus and Luther, and pronounce Washington and Franklin rebels?...

Under a government which imprisons any unjustly, the true place for a just man is also a prison.

Thoreau's essay "On the Duty of Civil Disobedience" influenced Mahatma Gandhi and Rev. Martin Luther King Jr. Here are Dr. King's words about Thoreau's essay:

Here, in this courageous New Englander's refusal to pay his taxes and his choice of jail rather than support a war that would spread slavery's territory into Mexico, I made my first contact with the theory of nonviolent resistance. Fascinated by the idea of refusing to cooperate with an evil system, I was so deeply moved that I reread the work several times. I became convinced that noncooperation with evil is as much a moral obligation as is cooperation with good. No other person has been more eloquent and passionate in getting this idea across than Henry David Thoreau. As a result of his writings and personal witness, we are the heirs of a legacy of creative protest. The teachings of Thoreau came alive in our civil rights movement; indeed, they are more alive than ever before. Whether expressed in a sit-in at lunch counters, a freedom ride into Mississippi, a peaceful protest in Albany, Georgia, a bus boycott in Montgomery, Alabama, these are outgrowths of Thoreau's insistence that evil must be resisted and that no moral man can patiently adjust to injustice.

### Suggestions for further reading

1. Furtak, Rick, *Henry David Thoreau*. The Stanford Encyclopedia of Philosophy, (2013).
2. Allen, Francis H. *A Bibliography of Henry David Thoreau*. Boston: Houghton Mifflin, (1908)
3. Borst, Raymond R. *Henry David Thoreau: A Descriptive Bibliography*. Pittsburgh: University of Pittsburgh Press, (1982).
4. Harding, Walter. *A Bibliography of the Thoreau Society Bulletin Bibliographies: 1941-1969*. Troy, N.Y.: Whitston Publishing, (1971).
5. Howarth, William L. *The Literary Manuscripts of Henry David Thoreau*, Columbus: Ohio State University Press, (1974).
6. Sattelmeyer, Robert. *Thoreau's Reading: A Study in Intellectual History, with a Bibliographical Catalog*, Princeton: Princeton University Press, (1988).

# Chapter 4

## JOHN MUIR

### 4.1 The life of John Muir

#### His strictly religious family in Scotland

John Muir (1838-1914) has often been called “The Father of the National Parks”. He was born in Scotland, to a family whose strictly religious father made him study the Bible for hours every day. The young John Muir ultimately memorized all of the New Testament and three-quarters of the Old Testament. Muir remained religious throughout his life, but he later came to see Nature as the great teacher rather than the Bible.

#### A farm in Wisconsin

In 1849, when John Muir was 11 years old, his family emigrated to America and bought a farm in Portage, Wisconsin. Later, when Muir was 22 years old, he enrolled in the University of Wisconsin, paying his own way, and enthusiastically taking courses on botany and geology; but because he picked courses according to his own interest, he never obtained a degree from the university.

#### Vocation as a naturalist and writer

John Muir finally found his true vocation in exploring wilderness regions and writing about them. Here is an excerpt from one of his books *Studies in the Sierra*:

**In the beginning of the long glacial winter, the lofty Sierra seems to have consisted of one vast undulated wave, in which a thousand separate mountains, with their domes and spires, their innumerable canyons and lake basins, lay concealed. In the development of these, the Master Builder chose for a tool, not the earthquake nor lightning to rend and split asunder, not the stormy torrent nor eroding rain, but the tender snow-flowers, noiselessly falling through unnumbered seasons, the offspring of the sun and sea. If we should attempt to restore the range to its pre-glacial unsculptured condition, its network of**

profound canyons would have to be filled up, together with all its lake and meadow basins; and every rock and peak, however lofty, would have to be buried again beneath the fragments which the glaciers have broken off and carried away. Careful study of the phenomena presented warrants the belief that the unglaciated condition of the range was comparatively simple; yet the double summits about the head of Kern River and Lake Tahoe, and the outlying spurs of Hoffmann and Merced, would appear to indicate the primary existence of considerable depressions and elevations. Even these great features, however, may be otherwise accounted for.

Because of the great popularity of his writing, Muir became influential in the movement to preserve wilderness regions as national parks.

## **Influenced by Thoreau and Emerson**

John Muir read the books of Henry David Thoreau and Ralph Waldo Emerson and was much influenced by them. He wrote that on his excursions in Yosemite he traveled alone, carrying “only a tin cup, a handful of tea, a loaf of bread, and a copy of Emerson”. In 1871, Emerson traveled to Yosemite with some academic friends, and met John Muir. According to the naturalist John Tallmadge, “Emerson was delighted to find at the end of his career the prophet-naturalist he had called for so long ago ... And for Muir, Emerson’s visit came like a laying on of hands”.

## **Co-founding the Sierra Club**

Wikipedia states that “The Sierra Club is an environmental organization in the United States. It was founded on May 28, 1892, in San Francisco, California, by the Scottish-American preservationist John Muir, who became its first president...Traditionally associated with the progressive movement, the club was one of the first large-scale environmental preservation organizations in the world, and currently engages in lobbying politicians to promote environmentalist policies.”

## **Camping with President Theodore Roosevelt**

In 1903, US President Theodore Roosevelt accompanied John Muir on a visit to Yosemite. Before they even arrived, Muir had managed to convince Roosevelt that the best way to preserve the region’s beauty was through federal management. The president then asked Muir to show him the real Yosemite, and the two men set off on a camping trip on which they were largely unaccompanied. They talked late into the night, and slept in the open air. Roosevelt later told an audience, “Lying out at night under those giant Sequoias was like lying in a temple built by no hand of man, a temple grander than any human architect could by any possibility build.”

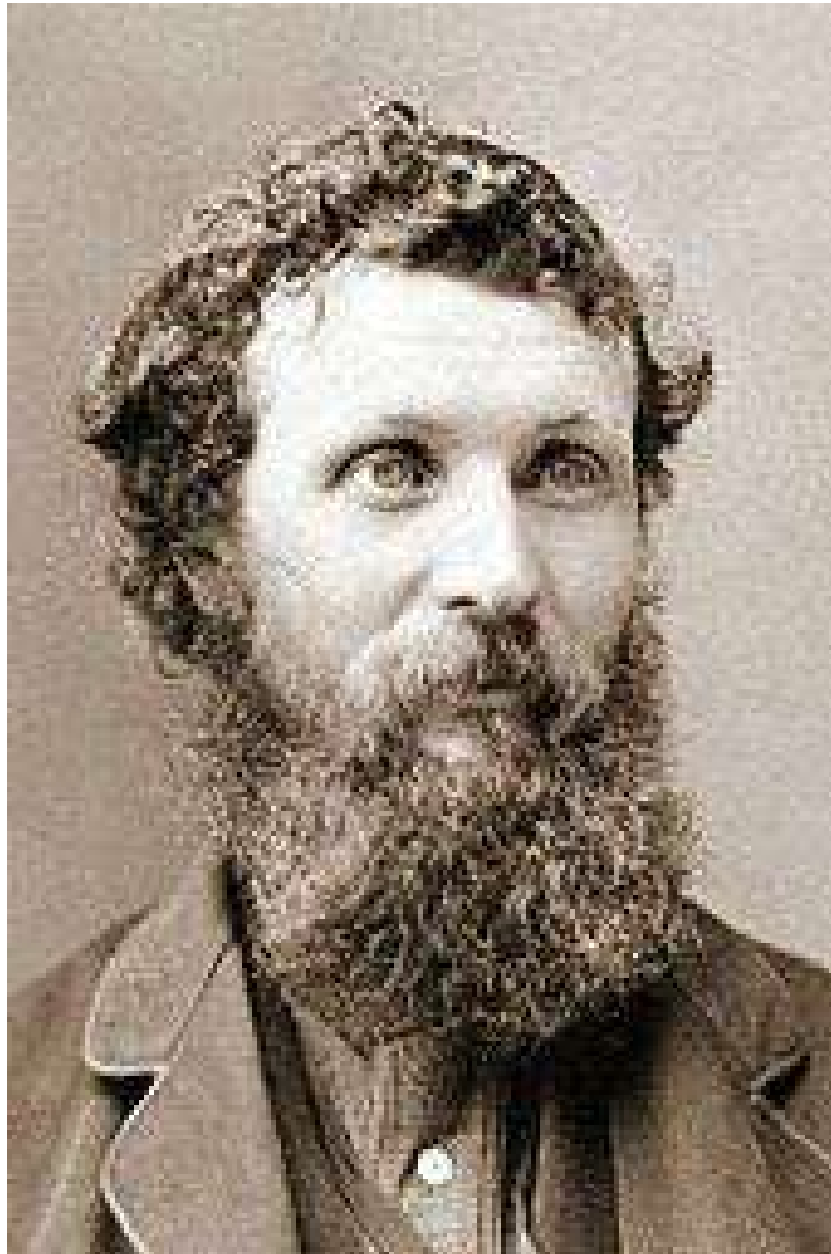


Figure 4.1: Photo of Muir by Carleton Watkins, circa 1875.



Figure 4.2: John Muir, c. 1902.



Figure 4.3: John Muir in 1907. Muir became convinced that glaciers had sculpted many of the features of the Yosemite Valley and surrounding area. This notion was in stark contradiction to the accepted contemporary theory.



Figure 4.4: **John Muir and US President Theodore Roosevelt at Yosemite.** Muir persuaded Roosevelt to make Yosemite a National Park.



Figure 4.5: Theodore Roosevelt and Muir, 1906.



Figure 4.6: The Muirs' home in Martinez, California, is a US National Historic Site. John Muir married at the age of 40. He was a dutiful husband, father and son-in-law, but sometimes became restless. His understanding family then encouraged him to spend a few months in his true home - the mountain wilderness.



Figure 4.7: Posthumous portrait by Orlando Rouland (1917).



Figure 4.8: Mount Muir located one mile south of Mount Whitney in the High Sierra.

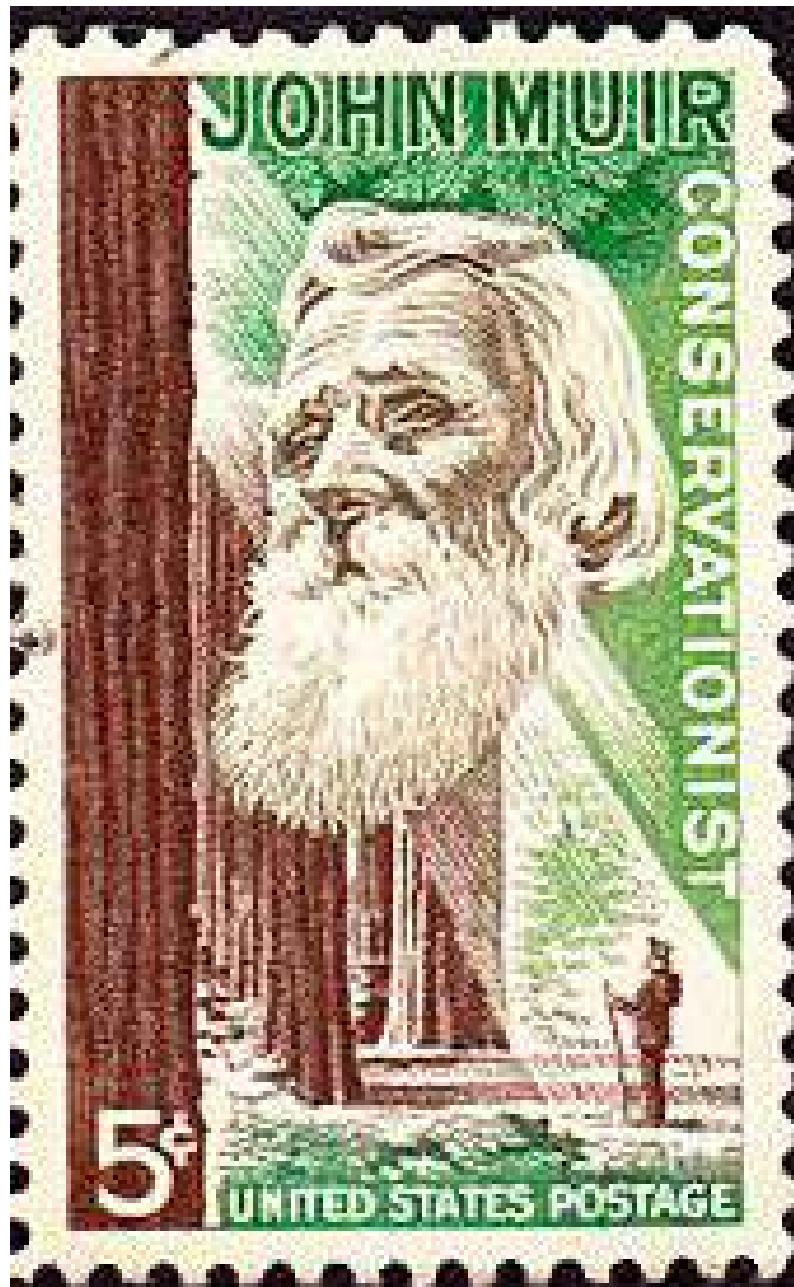


Figure 4.9: John Muir on a 1964 U.S. commemorative stamp.

## 4.2 Places named after John Muir

- Mount Muir
- Mount Muir in Chugach Mountains of Alaska
- Mount Muir (elevation 4688') in Angeles National Forest north of Pasadena, California
- Muir's Peak next to Mount Shasta, California (also known as Black Butte)
- Muir Glacier and Muir Inlet, Alaska
- John Muir Trails in California, Tennessee, Connecticut, and Wisconsin
- John Muir Wilderness (southern and central Sierra Nevada)
- Muir Pass Sequoia and Kings Canyon National Parks, the divide at 11,955' above sea level, between Evolution Creek and Middle Fork of Kings River
- Muir Woods National Monument just north of San Francisco, California
- Muir Beach, California
- John Muir National Historic Site in Martinez, California
- Camp Muir in Mount Rainier National Park
- Camp Muir on Mount Kilimanjaro
- John Muir College, one of the six undergraduate colleges of University of California, San Diego
- John Muir Highway - a section of California State Route 132 between Coulterville and Smith Station at California State Route 120. This road roughly follows part of the route Muir took on his first walk to Yosemite.
- The main-belt asteroid 128523 Johnmuir
- John Muir Country Park, East Lothian. Scotland.
- John Muir Way long distance trail in southern Scotland.
- John Muir House - the headquarters building of East Lothian Council, Scotland.
- John Muir Campus, Dunbar. One of two campuses of Dunbar Primary School, the successor to the school Muir attended.

## 4.3 National parks in the United States

The United States has 61 national parks. Below are some images from Muir Woods, just north of San Francisco, Yosemite National Park, and Grand Canyon National Park.

















## Books and essays by John Muir

Most of these books and essays can be read online. See, for example, Project Gutenberg or the Wikipedia article on John Muir.

### Books

- *Studies in the Sierra* (1950 reprint of serials from 1874)
- *Picturesque California* 1888
- *The Mountains of California*. New York: Century, 1894.
- *Stickeen: An Adventure with a Dog and a Glacier* (1897)
- *Our National Parks*. Boston: Houghton, Mifflin, 1901.
- *My First Summer in the Sierra*. Boston: Houghton Mifflin, 1911.
- *The Yosemite*. New York: Century, 1912.
- *The Story of My Boyhood and Youth*. Boston: Houghton Mifflin, 1913.
- *Travels in Alaska*. Boston: Houghton Mifflin, 1915.
- *Letters to a Friend*. Boston: Houghton Mifflin, 1915.
- *A Thousand-mile Walk to the Gulf*. Boston: Houghton Mifflin, 1916.
- *The Cruise of the Corwin*. Boston: Houghton Mifflin, 1917.
- *Steep Trails*. Boston: Houghton, 1918.
- *Nature Writings: The Story of My Boyhood and Youth; My First Summer in the Sierra; The Mountains of California; Stickeen; Selected Essays*. New York: Library of America, 1997.
- Gifford, Terry. *John Muir: His Life and Letters and Other Writings*. London: Seattle: Mountaineers, 1996. ed.
- Tim Flinders. *John Muir: Spiritual Writings* Maryknoll, NY: Orbis Books, 2013

### Essays

- *Alaska. The Discovery of Glacier Bay*
- *The American Forests*
- *Among the Animals of the Yosemite*
- *Among the Birds of the Yosemite*
- *The Coniferous Forests of the Sierra Nevada*
- *Features of the Proposed Yosemite National Park*
- *The Forests of Yosemite Park*
- *Fountains and Streams of the Yosemite*
- *In the Heart of the California Alps*
- *Living Glaciers of California*
- *The New Sequoia Forests of California*
- *A Rival of the Yosemite, King's River Canyon*
- *Snow-Storm on Mount Shasta*
- *Studies in the Sierra: The Glacier Meadows of the Sierra*

- *Studies in the Sierra: The Mountain Lakes of California*
- *Studies in the Sierra: The Passes of the Sierra*
- *The Treasures of the Yosemite*
- *The Wild Gardens of the Yosemite Park*
- *The Wild Parks and Forest Reservations of the West*
- *The Wild Sheep of the Sierra*
- *The Yellowstone National Park*
- *The Yosemite National Park*

### Suggestions for further reading

1. Austin, Richard C. (1991). *Baptized into wilderness: A Christian perspective on John Muir*. Creekside Press.
2. Bilbro, Jeffrey. "Preserving "God's Wildness" for Redemptive Baptism: Muir and Disciples of Christ Theology," in *Loving God's Wildness: The Christian Roots of Ecological Ethics in American Literature*. Tuscaloosa: U of Alabama P, 2015. 63-98.
3. Blessing, Matt. 'The inventions, though of little importance, opened all doors for me': *John Muir's Years as an Inventor*. Wisconsin Magazine of History, vol. 99, no. 4 (Summer 2016): 16-27.
4. Ehrlich, Gretel (2000). *John Muir: Nature's Visionary*. National Geographic.
5. Engberg, Robert and Donald Wesling, 1999. *John Muir: To Yosemite and Beyond*. University of Utah Press: Salt Lake City.
6. Fleck, Richard F., ed., 1997. *Mountaineering Essays*. University of Utah Press: Salt Lake City.
7. Gifford, Terry (2011). *John Muir's Literary Science*. The Public Domain Review.
8. Hunt, James B. 2013. *Restless Fires: Young John Muir's Thousand Mile Walk to the Gulf in 1867-68*. Mercer University Press.
9. Lasky, Kathryn. *John Muir: America's first environmentalist* (Candlewick Press, 2014)
10. Miller, Char (2001). *Gifford Pinchot and the Making of Modern Environmentalism*. Island Press.
11. O'Casey, Terrence (September 24, 2006). *John Muir: God's Preacher of Creation*. Christian Standard.
12. Turner, Frederick. *John Muir: From Scotland to the Sierra: A Biography* (Canongate Books, 2014)
13. White, Graham (ed) (2009). *Journeys in the Wilderness, A John Muir Reader*. Birlinn.
14. Williams, Dennis (2002). *God's Wilds: John Muir's Vision of Nature*. Texas A&M University Press.
15. Witschi, N.S. (2002). *Traces of Gold: California's Natural Resources and the Claim to Realism in Western American Literature*. Tuscaloosa: University of Alabama Press.

16. Worster, Donald (2008). *A Passion for Nature: The Life of John Muir*. Oxford University Press.
17. Wuerthner, George (1994). *Yosemite: A Visitor's Companion*. Stackpole Books. pp. 25-37.
18. Young, Samuel Hall (1915). *Alaska Days with John Muir*. Fleming H. Revell.



## Chapter 5

# JOHN TYNDALL AND SVANTE ARRHENIUS

### 5.1 John Tyndall

#### Tyndall's early life in Ireland

John Tyndall (1820-1893) was an important pioneer of climate science. He was born in Ireland, and as a young man worked as a surveyor for railway companies. In an era of rapid railway expansion, it was lucrative work.

#### Study of experimental physics in Germany

Later, when the railway building work slackened, he became a teacher of mathematics and surveying at Queenwood College. At the college, Tyndall became the close friend of Edward Frankland, who was later knighted for founding the field of organo-metalic chemistry. The two friends decided that they needed further education in experimental physics, and that this could only be obtained in Germany. Accordingly, they enrolled at the University of Marburg where they studied under the famous experimental physicist Robert Bunsen, as well as Professor Heinrich Gustav Magnus.

#### Professor of physics at the Royal Institution

Returning to England, Tyndall used his experimental proficiency to study the phenomenon of diamagnetism, and its relationship to the arrangement of molecules in diamagnetic materials. This work brought him to the favorable attention of Michael Faraday, the Director of the Royal Institution. Faraday appointed Tyndall as Professor of Physics at the Royal Institution. It was here that Tyndall performed his pioneering experiments which led to his discovery of infrared radiation, and to his measurements of the absorption of radiation by many gases that are found in the earth's atmosphere. He studied many gases, including water vapor, carbon dioxide, methane, oxygen and nitrogen, and concluded that water

vapor is the strongest absorber of infrared radiation. His experiments required great skill and dexterity, in addition to scientific understanding.

## Books by John Tyndall

- Tyndall, J. (1860), *The glaciers of the Alps, Being a narrative of excursions and ascents, an account of the origin and phenomena of glaciers and an exposition of the physical principles to which they are related*, (1861 edition) Ticknor and Fields, Boston
- Tyndall, J. (1862), *Mountaineering in 1861. A vacation tour*, Longman, Green, Longman, and Roberts, London
- Tyndall, J. (1865), *On Radiation: One Lecture*, (40 pages)
- Tyndall, J. (1868), *Heat : A mode of motion*, (1869 edition) D. Appleton, New York
- Tyndall, J. (1869), *Natural Philosophy in Easy Lessons* (180 pages) (a physics book intended for use in secondary schools)
- Tyndall, J. (1870), *Faraday as a discoverer*, Longmans, Green, London
- Tyndall, J. (1870), *Three Scientific Addresses by Prof. John Tyndall* (75 pages)
- Tyndall, J. (1870), *Notes of a Course of Nine Lectures on Light* (80 pages)
- Tyndall, J. (1870), *Notes of a Course of Seven Lectures on Electrical Phenomena and Theories* (50 pages)
- Tyndall, J. (1870), *Researches on diamagnetism and magne-crystallic action: including the question of diamagnetic polarity, (a compilation of 1850s research reports)*, Longmans, Green, London
- Tyndall, J. (1871), *Hours of exercise in the Alps*, Longmans, Green, and Co., London
- Tyndall, J. (1871), *Fragments of Science: A Series of Detached Essays, Lectures, and Reviews*, (1872 edition), Longmans, Green, London
- Tyndall, J. (1872), *Contributions to Molecular Physics in the Domain of Radiant Heat, (a compilation of 1860s research reports)*, (1873 edition), D. Appleton and Company, New York
- Tyndall, J. (1873), *The forms of water in clouds & rivers, ice & glaciers*, H. S. King & Co., London
- Tyndall, J. (1873), *Six Lectures on Light* (290 pages)
- Tyndall, J. (1876), *Lessons in Electricity at the Royal Institution* (100 pages), (intended for secondary school students)
- Tyndall, J. (1878), *Sound; delivered in eight lectures*, (1969 edition), Greenwood Press, New York
- Tyndall, J. (1882), *Essays on the floating matter of the air, in relation to putrefaction and infection*, D. Appleton, New York
- Tyndall, J. (1887), *Light and electricity: notes of two courses of lectures before the Royal institution of Great Britain*, D. Appleton and Company, New York
- Tyndall, J. (1892), *New Fragments (miscellaneous essays for a broad audience)*, D. Appleton, New York



Figure 5.1: Jean Baptiste Joseph Fourier (1768-1830), French mathematician and natural philosopher, did groundbreaking work in mathematics and the theory of heat. He was the first to propose that the Earth's atmosphere acts to raise the planet's temperature.



Figure 5.2: Eunice Newton Foote (1819-1888) was the first person to perform measurements on the absorption of radiation by  $\text{CO}_2$ . Since she worked in the United States and published her results there, John Tyndall did not know of her work

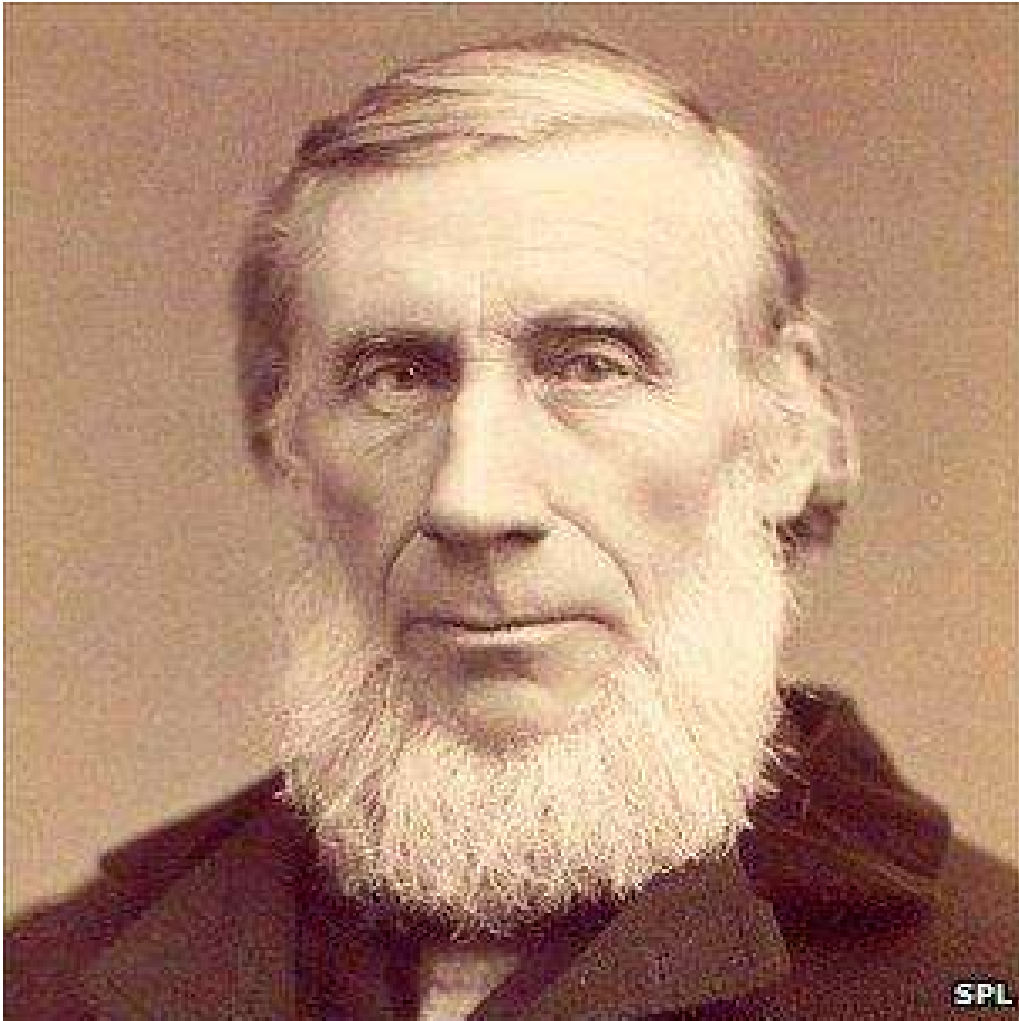


Figure 5.3: John Tyndall (1820-1893) was a physicist who discovered, among many other things, infrared radiation. Because of his studies of the absorption of radiation by  $\text{CO}_2$  and many other gases, he is considered to be an important pioneer of climate science.

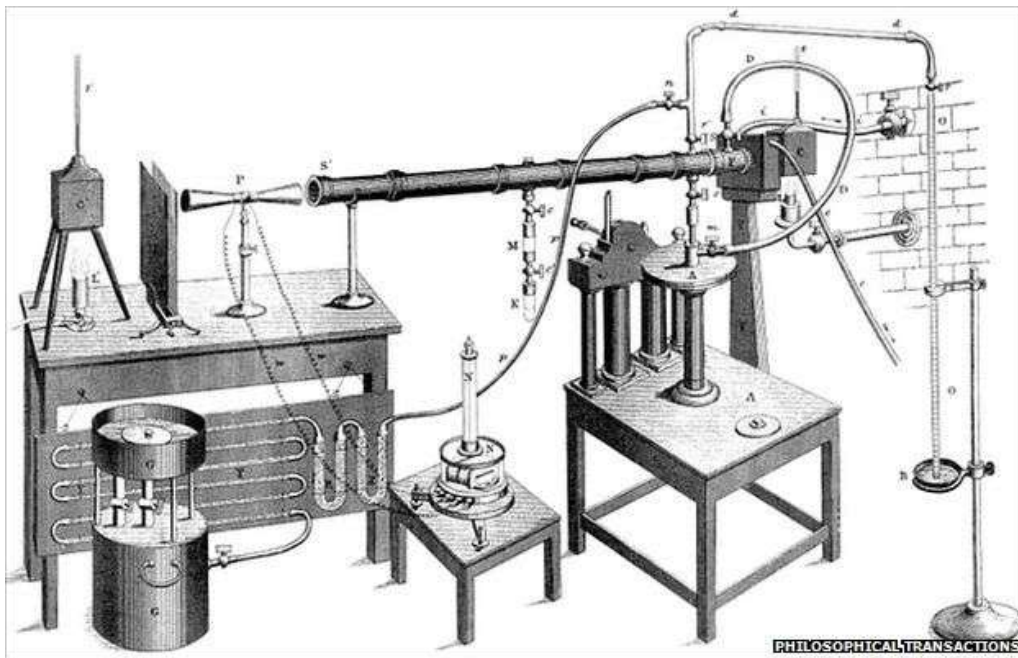


Figure 5.4: Tyndall's experiment for measuring the absorption of radiation by various gases. It required tremendous dexterity, as well as experimental understanding.

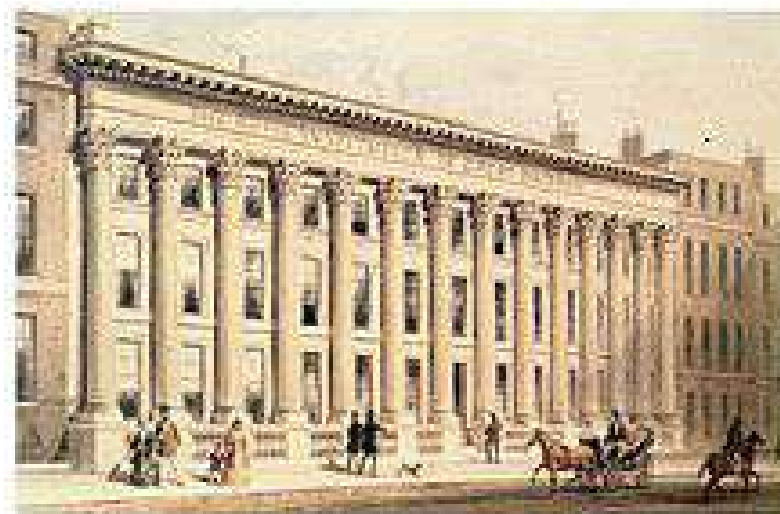


Figure 5.5: The Royal Institution building on Albemarle Street, London, circa 1838. Queen Victoria's husband, Prince Albert, often attended lectures there together with his sons.



Figure 5.6: Tyndall lecturing at the Royal Institution.

## 5.2 Svante Arrhenius

Svante Augustus Arrhenius was born in Wik Castle, Sweden in 1859, the son of Svante Gustav and Carolina Thunberg Arrhenius. He was a child prodigy, who without encouragement from his parents, taught himself to read at the age of 3. As a very young child, he also became an arithmetical prodigy by watching his father add numbers in his account books.

Arrhenius started research at the University of Uppsala, but he was dissatisfied with the instruction in physics and chemistry. In 1881 he moved to the Swedish Academy of Sciences in Stockholm. There he produced a Ph.D. dissertation which focused on conductivity of electrolytes. The dissertation was so contrary to the chemical ideas of the time that it was accepted only grudgingly by the committee judging it, and Arrhenius was only granted a 4th class degree. Nevertheless, the 56 propositions put forward in the dissertation are universally accepted today, almost entirely without modification, and they won Arrhenius the 1903 Nobel Prize in Chemistry.

Michael Faraday (1791-1867) had previously shown that charged particles, which he named “ions”, could carry an electrical current through a solution. Arrhenius developed Faraday’s concept of ions by demonstrating that when salts are dissolved in water, ions are present even without an electrical current. He also defined acids to be substances which produce solutions in which  $H^+$  ions predominate, while in bases, when dissolved, produce solutions in which  $OH^-$  ions predominate.

In chemical reaction theory, Arrhenius introduced the idea of an activation energy,  $E_a$ , which can be thought of as the height of an energy barrier which must be surmounted in order for the reaction to take place. Thus most chemical reactions become more probable when the temperature  $T$  is raised, since the rapid motion of the reactants at higher temperatures can supply the energy needed to overcome the reaction barrier  $E_a$ . Arrhenius connected the concept of activation energy with the statistical mechanics of Ludwig Boltzmann (1844-1906) by means of his famous equation:

$$k = A e^{-E_a/RT}$$

In the Arrhenius equation,  $k$  is the reaction rate,  $A$  is a constant proportional to the frequency of reactant collisions with the proper orientation,  $T$  is the absolute temperature, and  $R$  is the constant that appears in the equation of state of a perfect gas,  $PV = nRT$ .

### Climate science

Wikipedia states that “In developing a theory to explain the ice ages, Arrhenius, in 1896, was the first to use basic principles of physical chemistry to calculate estimates of the extent to which increases in atmospheric carbon dioxide ( $CO_2$ ) will increase Earth’s surface temperature through the greenhouse effect.

“These calculations led him to conclude that human-caused  $CO_2$  emissions, from fossil-fuel burning and other combustion processes, are large enough to cause global warming.



Figure 5.7: Svante Arrhenius (1859-1927) was one of the main founders of physical chemistry and a pioneer of climate science. A child prodigy, he taught himself to read and to calculate at the age of three. He was related to climate activist Greta Thunberg, and Greta's father, Svante Thunberg, is named after him. Arrhenius received the Nobel Prize in Chemistry in 1903 for work that he had done much earlier when he was writing his doctoral dissertation.

This conclusion has been extensively tested, winning a place at the core of modern climate science.

“Arrhenius, in this work, built upon the prior work of other famous scientists, including Joseph Fourier, John Tyndall and Claude Pouillet. Arrhenius wanted to determine whether greenhouse gases could contribute to the explanation of the temperature variation between glacial and inter-glacial periods. Arrhenius used infrared observations of the moon - by Frank Washington Very and Samuel Pierpont Langley at the Allegheny Observatory in Pittsburgh - to calculate how much of infrared (heat) radiation is captured by CO<sub>2</sub> and water (H<sub>2</sub>O) vapour in Earth’s atmosphere...

“Based on information from his colleague Arvid Högbom, Arrhenius was the first person to predict that emissions of carbon dioxide from the burning of fossil fuels and other combustion processes were large enough to cause global warming. In his calculation Arrhenius included the feedback from changes in water vapor as well as latitudinal effects, but he omitted clouds, convection of heat upward in the atmosphere, and other essential factors. His work is currently seen less as an accurate quantification of global warming than as the first demonstration that increases in atmospheric CO<sub>2</sub> will cause global warming, everything else being equal.”

### Some quotations from Arrhenius’ book, *Worlds in the Making*

To a certain extent the temperature of the earth’s surface, as we shall presently see, is conditioned by the properties of the atmosphere surrounding it, and particularly by the permeability of the latter for the rays of heat. (p46)

That the atmospheric envelopes limit the heat losses from the planets had been suggested about 1800 by the great French physicist Fourier. His ideas were further developed afterwards by Pouillet and Tyndall. Their theory has been styled the hot-house theory, because they thought that the atmosphere acted after the manner of the glass panes of hot-houses. (p51)

If the quantity of carbonic acid [CO<sub>2</sub>] in the air should sink to one-half its present percentage, the temperature would fall by about 4°; a diminution to one-quarter would reduce the temperature by 8°. On the other hand, any doubling of the percentage of carbon dioxide in the air would raise the temperature of the earth’s surface by 4°; and if the carbon dioxide were increased fourfold, the temperature would rise by 8°. (p53)

Although the sea, by absorbing carbonic acid, acts as a regulator of huge capacity, which takes up about five-sixths of the produced carbonic acid, we yet recognize that the slight percentage of carbonic acid in the atmosphere may by the advances of industry be changed to a noticeable degree in the course of a few centuries. (p54)

Since, now, warm ages have alternated with glacial periods, even after man appeared on the earth, we have to ask ourselves: Is it probable that we shall in the coming geological ages be visited by a new ice period that will drive us from our temperate countries into the hotter climates of Africa? There

does not appear to be much ground for such an apprehension. The enormous combustion of coal by our industrial establishments suffices to increase the percentage of carbon dioxide in the air to a perceptible degree. (p61)

## 5.3 The Keeling curve

Dr. Charles David Keeling (1928-2005) was a geochemist who developed a very accurate instrument for measuring atmospheric CO<sub>2</sub> levels. During the International Geophysical Year 1957-1958 he was asked to establish a laboratory for making CO<sub>2</sub> measurements at the Mauna Loa Observatory in Hawaii, two miles above sea level. Keeling's initial measurements worried him, because they were sometimes higher, and sometimes lower. However, he soon realized that these seeming inconsistencies were not errors, but real seasonal variations. Keeling continued these measurements until his death in 2005, after which the work has been continued by his son, Ralph. The great importance of the Keeling curve is widely recognized.

### Charles Keeling's awards and honors

- Second Half Century Award of the American Meteorological Society, 1981
- Maurice Ewing Medal of the American Geophysical Union, 1991
- Blue Planet Prize from the Science Council of Japan and the Asahi Glass Foundation, 1993
- At a White House ceremony held in July 1997, Keeling was presented with a "special achievement award" from Vice President Al Gore. Keeling was honored "for 40 years of outstanding scientific research associated with monitoring of atmospheric carbon dioxide in connection with Mauna Loa Observatory".
- In 2002, President George W. Bush presented Keeling with the National Medal of Science, the highest US award for scientific research lifetime achievement.
- Keeling received the Tyler Prize for Environmental Achievement in 2005.
- The Keeling Curve is "engraved in bronze on a building at Mauna Loa and carved into a wall at the National Academy of Sciences in Washington." It was also a chart on the wall in a classroom at Harvard University where Dr. Revelle had moved to teach in the 1960s and where among others, student Al Gore would see and "marvel" at it. In 2006, Gore would feature the graph in the book and movie *An Inconvenient Truth* and for that work with climate change go on to win, with the United Nations' Intergovernmental Panel on Climate Change, the 2007 Nobel Peace Prize.
- The Revelle College apartments at the University of California San Diego, which were designed to emphasize environmental awareness and minimize ecological impact, are named the Charles David Keeling Apartments in his honor.
- Since 2014 Keeling's life and work has been the subject of a one-man play, *Dr Keeling's Curve*, written by George Shea and performed by Mike Farrell



Figure 5.8: Charles David Keeling (1928-2005) receives the Medal of Science in 2001.

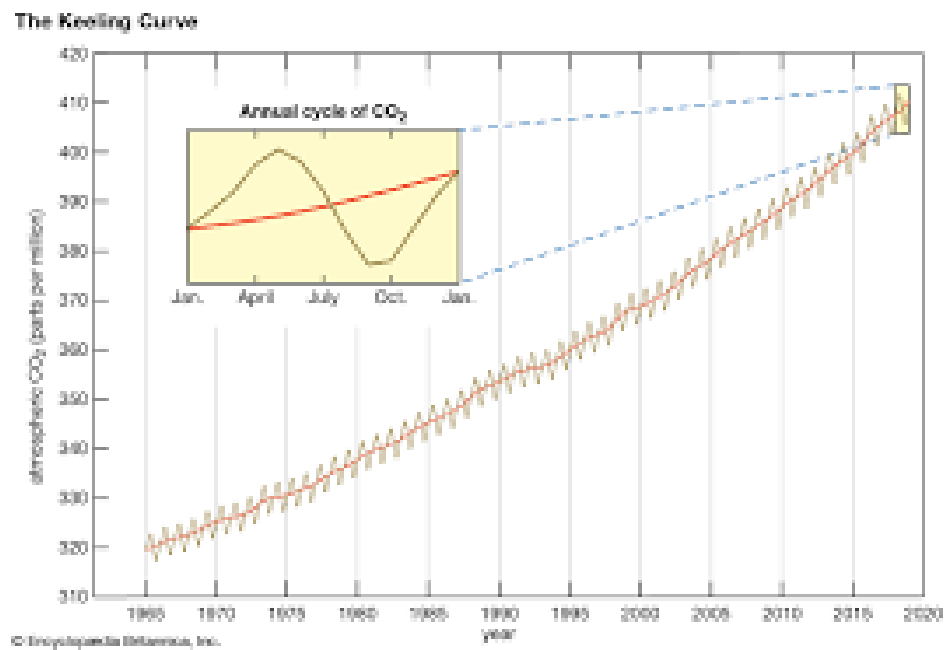


Figure 5.9: The Keeling curve shows measurements of atmospheric CO<sub>2</sub> concentration made at the Mauna Loa Observatory in Hawaii. The graph extends from 1960 to the present. The seasonal fluctuations are due to the trapping of carbon in forest leaves during the summer months. CO<sub>2</sub> concentrations today are double preindustrial levels, and they continue to increase despite international efforts to reduce emissions.

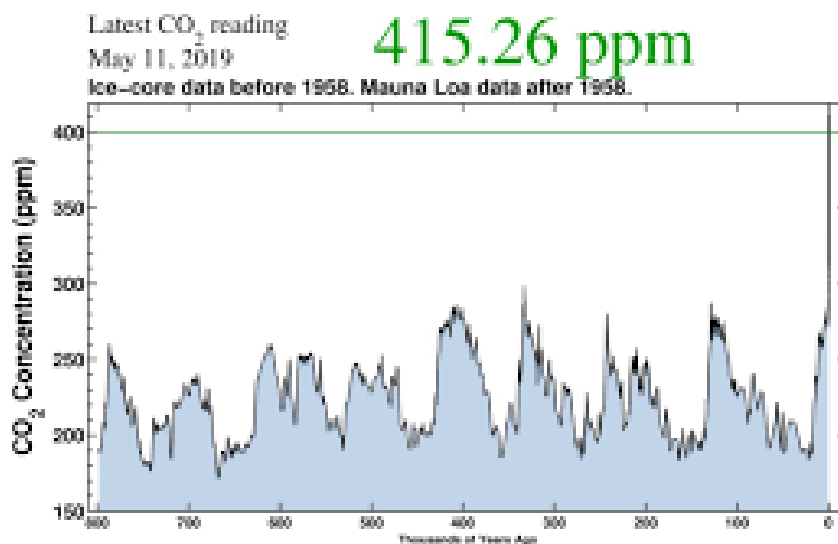


Figure 5.10: It is possible to extend the Keeling curve far backward in time by looking at gas trapped in the ice of Antarctica. Results show that the concentration of CO<sub>2</sub> in the earth's atmosphere is higher today than it has been for 800,000,000 years..

### Suggestions for further reading

1. Eve, A.S.; Creasey, C.H. (1945). *Life and Work of John Tyndall*. London: Macmillan. 430 pages. This is the "official" biography.
2. William Tulloch Jeans wrote a 100-page biography of Professor Tyndall in 1887 (the year Tyndall retired from the Royal Institution). Downloadable.
3. Louisa Charlotte Tyndall, his wife, wrote an 8-page biography of John Tyndall that was published in 1899 in Dictionary of National Biography (volume 57). It is readable online (and a 1903 republication of the same biography is also readable online).
4. Edward Frankland, a longtime friend, wrote a 16-page biography of John Tyndall as an obituary in 1894 in a scientific journal. It is readable online.
5. D. Thompson (1957). *John Tyndall (1820-1893): A study in vocational enterprise*. Journal of Vocational Education & Training. 9 (18): 38-48. Gives an account of Tyndall's vocational development prior to 1853.
6. Brock, W.H. (1981). *John Tyndall, Essays on a Natural Philosopher*. Dublin: Royal Dublin Society. 220 pages.
7. Arthur Whitmore Smith, a professor of physics, wrote a 10-page biography of John Tyndall in 1920 in a scientific monthly. Readable online.
8. Anon (1894). *Obituary notices*. Journal of the Chemical Society, Transactions. 65: 389-393.
9. John Walter Gregory, a naturalist, wrote a 9-page obituary of John Tyndall in 1894 in a natural science journal. Readable online.

10. An early, 8-page profile of John Tyndall appeared in 1864 in *Portraits of Men of Eminence in Literature, Science and Art*, Volume II, pages 25-32.
11. A brief profile of Tyndall based on information supplied by Tyndall himself appeared in 1874 in *Scientific worthies, IV.—John Tyndall*. *Nature*. 10 (251): 299-302. Bib-code:1874Natur..10..299.
12. Claud Schuster, *John Tyndall as a Mountaineer*, 56-page essay included in Schuster's book *Postscript to Adventure*, year 1950 (New Alpine Library: Eyre & Spottiswoode, London).
13. DeYoung, Ursula (2011). *A Vision of Modern Science: John Tyndall and the Role of the Scientist in Victorian Culture*. Palgrave Macmillan. p. 280. ISBN 0-230-11053-3..
14. Jackson, Roland (2018). *The Ascent of John Tyndall*. Oxford University Press. p. 556. The first major biography of Tyndall since 1945.



# Chapter 6

## RACHEL CARSON

### 6.1 From child author to marine biologist

#### Love of nature passed from mother to daughter

Rachel Carson (1907-1964) was born on her family's 65-acre farm near Springdale Pennsylvania. Although the farm was a large one, the family's home had no indoor plumbing and no electricity. Before her marriage, Rachel's mother had been an accomplished singer and musician, as well as a teacher. A special love for nature was transmitted from mother to daughter. During Rachel's early childhood, the two spent much time together exploring and enjoying the plants and animals on the family farm.

#### A published author at the age of 10

As a child, Rachel Carson was an avid reader. Her favorite author was Beatrix Potter, and her favorite story was Kenneth Grahame's *The Wind in the Willows*. She also began to write stories at the age of 8. By the time she was 10 years old, she was being paid for the publication of the stories by St. Nicholas Magazine.

#### Graduating at the top of her class

At school in Springdale, Rachel received straight A's and graduates at the top of her class. Her mother was anxious that her clever daughter should have the opportunity to develop her full potential. Both parents made considerable sacrifices to give their daughter the education that her abilities deserved, and in 1929 she graduated (again at the top of her class) from the elite Pennsylvania College for Women in Pittsburgh. She had started her studies as an English major, but later switched to biology.

The Great Depression was just starting, and although Rachel Carson enrolled for post-graduate studies at Johns Hopkins University, she was soon forced stop her studies and find work to support her mother (who was alone, following the death of Rachel's father). She was hired by the US Fish and Wildlife Service.



Figure 6.1: As a child, Rachel Carlson was fond of animals, and of writing. At the age of 10, she was earning money from the publication of her stories!



Figure 6.2: Rachel Carson graduated *magnum cum laude* from the Pennsylvania College for Women in 1929. She also took postgraduate courses at Johns Hopkins University, but was forced to leave without a degree in order to support her aging mother during the Great Depression.



Figure 6.3: Rachel Carson in 1940 (U.S. Fish and Wildlife Service employee photo). She came first, among all other applicants, on the Civil Service examination that won her the position.

## 6.2 The Sea Around Us

### An earlier book

*The Sea Around Us* was Rachel Carson's second book. Earlier, in 1941, her book *Under the Sea Wind* had been published by Simon and Schuster. It had won critical acclaim, but had sold poorly. In 1948, Carson began writing a sequel, which she at first planned to call *Return to the Sea*. A chapter entitled *The Birth of an Island* attracted the favorable attention of publishers and periodicals.

### Rachel Carson becomes a best-selling author

In June 1950, Rachel Carson finally completed the sequel to her first book. It was now renamed *The Sea Around Us*. Before its publication, nine of the fourteen chapters of the book were serialized in *The New Yorker*, while the chapter on *The Birth of an Island* was published by *The Yale Review*, where it won the the George Westinghouse Science Writing prize from the American Association for the Advancement of Science. The entire book was published on July 2, 1951, by Oxford University Press. Rachel Carson was immediately inundated by fan mail and media attention. The book won both the 1952 National Book Award for Nonfiction and a Burroughs Medal in nature writing. It remained on the New York Times Best Seller List for 86 weeks and it has been translated into 28 languages. A condensation of *The Sea Around Us*, published by *The Reader's Digest*, reached an extremely wide audience. The success of this book made Rachel Carson both famous and financially independent. She quit her government job in the summer of 1952. Her forgotten first book was rediscovered, joining *The Sea Around Us* on the Best Seller List.

At the National Book Award Ceremony, Rachel Carson said: "The aim of science is to discover and illuminate truth. And that, I take it, is the aim of literature, whether biography or history or fiction. It seems to me, then, that there can be no separate literature of science".

In 1952, Carson won an award that she had coveted - the John Burroughs Medal for the most distinguished natural history book. There were also several gold medals and honorary doctorates, including one from her alma mater. Requests for TV, radio, and newspaper interviews flooded in.

### A filmed version wins an Oscar

A documentary based on *The Sea Around Us*, written and produced by Irwin Allen, won the 1953 Academy Award for Best Documentary Feature, but Carson believed it was inaccurate and did not reflect her work properly. She quarreled with Irwin about the script, but discovered that her contract with him gave her no power to change anything. It was the last time she sold film rights to any of her works.

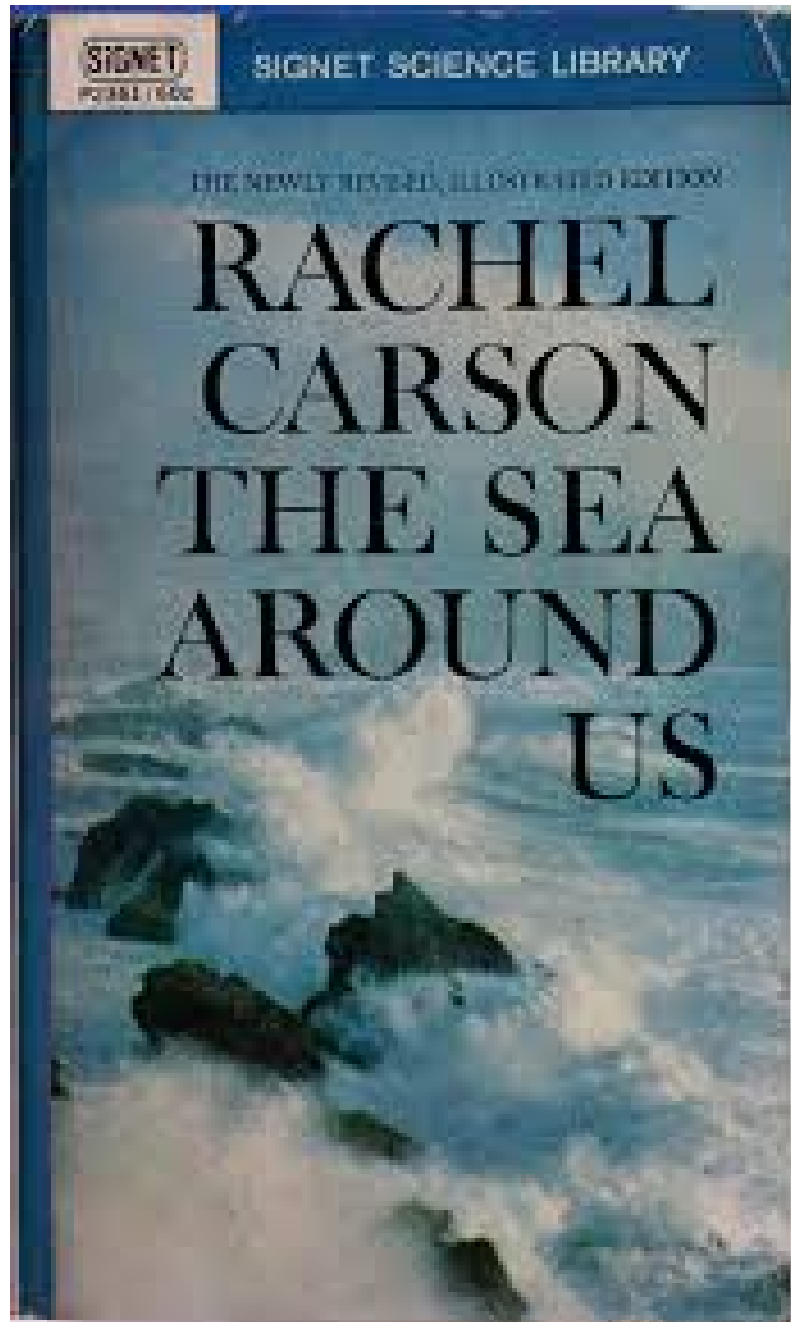


Figure 6.4: Rachel Carson's gift for writing combined with her wide knowledge of marine biology to make *The Sea Around Us* a best-seller.

## 6.3 The Silent Spring

### Dangers from pesticide pollution

Rachel Carson's most influential book, *The Silent Spring*, was published in 1962, when she was already suffering from breast cancer. Eventually it sold over two million copies. The book expresses Carson's worries about the environmental consequences of overuse of pesticides, such as DDT, which were killing not only their targeted pests, but also many vitally important insects, as well as causing health problems in humans. Part of the anger that Carson expressed in the book may have come because the cancer from which she was suffering could have been caused by mutagenic pesticides.

### The town was fictitious, but the problems were real

*The Silent Spring* begins by describing a fictitious Midwestern American town, where people are mysteriously suffering and dying from a variety of unexplained illnesses previously unseen by doctors. Sheep and cattle, fish in the river, and birds, all sicken and die. Orchards bear no fruit and vegetation withers. It gradually becomes clear that the people of the town are themselves to blame. That have been poisoning themselves and their environment by overuse of pesticides.

### Some quotations from *The Silent Spring*

Here are two quotations from the book:

As crude a weapon as the cave man's club, the chemical barrage has been hurled against the fabric of life - a fabric on the one hand delicate and destructible, on the other miraculously tough and resilient, and capable of striking back in unexpected ways... It is our alarming misfortune that so primitive a science has armed itself with the most modern and terrible weapons, and that in turning them against the insects it has also turned them against the earth...

Among the herbicides are some that are classified as 'mutagens,' or agents capable of modifying the genes, the materials of heredity. We are rightly appalled by the genetic effects of radiation; how then, can we be indifferent to the same effect in chemicals that we disseminate widely in our environment?

Although extremely ill with cancer and in constant pain, Carson gave newspaper interviews and appeared on television to make her case. In July, 1962, the US Department of agriculture issued the following statement: "Miss Carson provides a lucid description of the real and potential dangers of misusing chemical pesticides... She expresses the concern of many people about the effect of chemical pesticides on birds, animals and people. We are fully aware of and share this concern."

## 'Silent Spring' Is Now Noisy Summer

*Pesticides Industry  
Up in Arms Over  
a New Book*

By JOHN M. LEE

The \$300,000,000 pesticides industry has been highly irritated by a quiet woman author whose previous works on science have been praised for the beauty and precision of the writing.

The author is Rachel Carson, whose "The Sea Around Us" and "The Edge of the Sea" were best sellers in 1951 and 1955. Miss Carson, trained as a marine biologist, wrote gracefully of sea and shore life.

In her latest work, however, Miss Carson is not so gentle,



*Rachel Carson Stirs  
Conflict—Producers  
Are Crying 'Foul'*

fending the use of their products. Meetings have been held in Washington and New York. Statements are being drafted and counter-attacks plotted.

A drowsy midsummer has suddenly been enlivened by the greatest uproar in the pesticides industry since the cranberry scare of 1959.

Miss Carson's new book is entitled "Silent Spring." The title is derived from an idealized situation in which Miss Carson envisions an imaginary town where chemical pollution has silenced "the voices of nature."

Figure 6.5: Rachel Carson's book, *The Silent Spring*, was controversial, to say the least, but it focused public attention on problems of ecology.

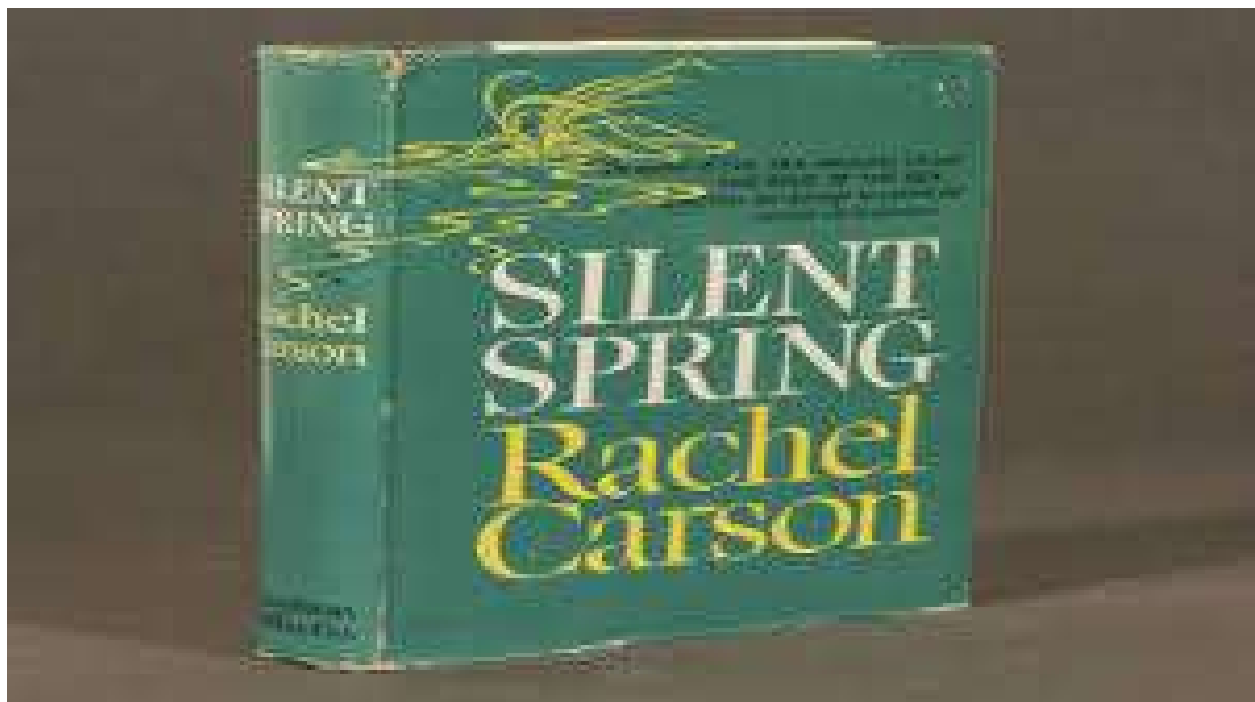


Figure 6.6: *The Silent Spring* was an international best-seller, and it ignited the environmental movement.

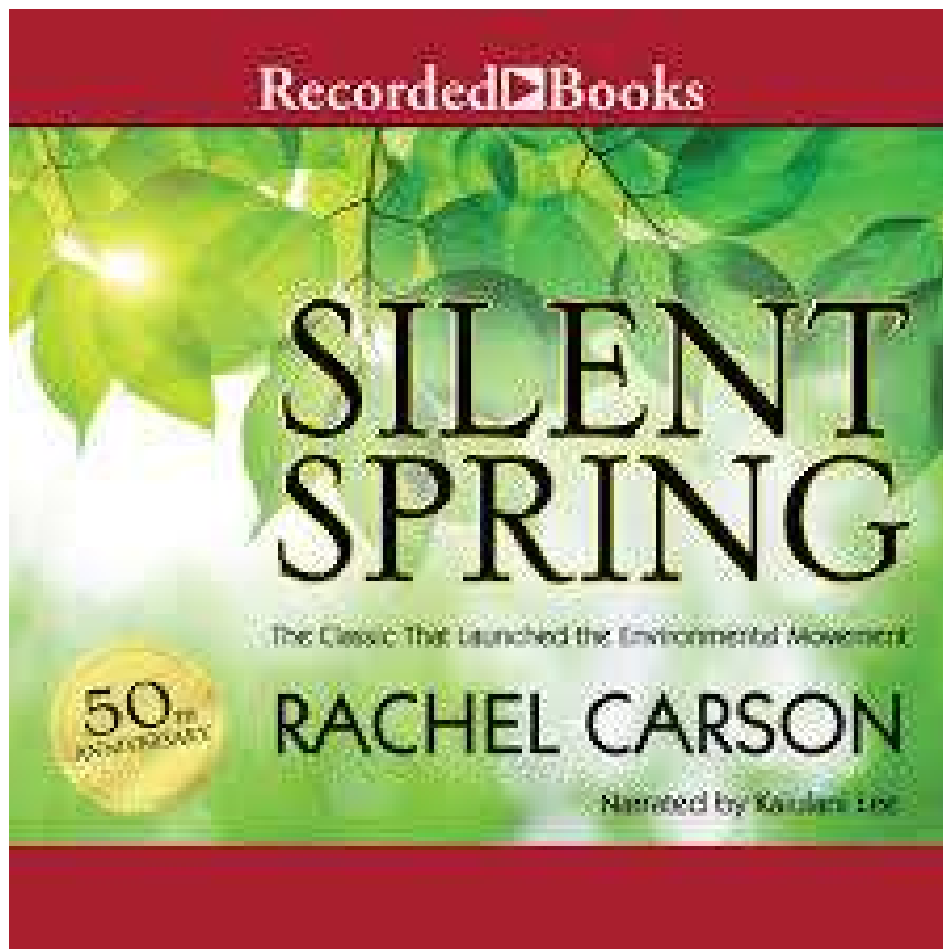


Figure 6.7: An audio version of *The Silent Spring*.



Figure 6.8: As Rachel Carson's influence increased, she began speaking to large audiences.



Figure 6.9: Statue of Carson at the Museo Rocsen, Nono, Argentina.

## 6.4 Overuse of pesticides and the insect apocalypse

### Loss of flying insects, especially bees

Studies have shown an annual decline of 5.2% in flying insect biomass found in nature reserves in Germany - about 75% loss in 26 years.

In the United States the managed bee populations have declined dramatically. According to one study, for the single year, from April 1, 2018, to April 1, 2019, the managed bee population decreased by 40.7%.

### Overuse of pesticides degrades topsoil

It is not only the loss of bees and other pollinator insects that is dangerous to agriculture. The excessive use of pesticides and other agricultural chemicals also degrades topsoil. Normally, topsoil contains richly numerous and diverse populations of tiny worms and bacteria, that aid the recycling of crop residue from previous years into nutrients for plant growth. However, the overuse of pesticides and other agricultural chemicals kills these vitally important populations. Carbon from the dead topsoil is released into the atmosphere, thus increasing the concentrations of dangerous greenhouse gases. Having killed the living topsoil, farmers then find that they need increased quantities of petroleum-derived fertilizers to make their crops grow.

### The Stockholm Convention on Persistent Organic Pollutants

An environmental treaty, signed in 2001 and effective since May, 2004, aims at restricting the production and use of persistent organic pollutants (POPs). These are defined by the United Nations Environmental Institute as “chemical substances that persist in the environment, bio-accumulate through the food web, and pose a risk of causing adverse effects to human health and the environment”. Besides DDT, the Stockholm Treaty also lists Aldrin,  $\alpha$ -Hexachlorocyclohexane,  $\beta$ -Hexachlorocyclohexane, Chlordane, Chlordecone, Decabromodiphenyl ether, Dicofol, Dieldrin, Endosulfan, Endrin, Heptachlor, Hexabromobiphenyl, Hexabromocyclododecane, Hexabromodiphenylether, Hexachlorobenzene, Hexachlorobutadiene, Lindane, Mirex, Pentachlorobenzene, Pentachlorophenol, Perfluorooctanoic acid, Perfluorooctane sulfonic acid, Polychlorinated biphenyls, Polychlorinated dibenzodioxins, Polychlorinated naphthalenes, Tetrabromodiphenyl ether, Short-chain chlorinated paraffins, and Toxaphene.

Although some critics have claimed that the treaty is responsible for the continuing death toll from malaria, in reality it specifically permits the public health use of DDT for the control of malaria-carrying mosquitoes. In 2016, there were 216 million cases of malaria worldwide, resulting in an estimated 445,000 to 731,000 deaths.



Figure 6.10: 20 May 2019, Rome - The global decline in bee populations poses a serious threat to a wide variety of plants critical to human well-being and livelihoods, and countries should do more to safeguard our key allies in the fight against hunger and malnutrition, FAO stressed today as it marked UN World Bee Day. Bees and other pollinator are declining in abundance in many parts of the world largely due to intensive farming practices, mono-cropping, excessive use of agricultural chemicals and higher temperatures associated with climate change, affecting not only crop yields but also nutrition. If this trend continues, nutritious crops such as fruits, nuts, and many vegetables will be substituted increasingly by staple crops like rice, corn, and potatoes, eventually resulting in an imbalanced diet.

**Suggestions for further reading**

1. Rachel L. Carson *Under the Sea-Wind* Oxford University Press, 1952
2. Rachel L. Carson *The Sea Around Us* Oxford University Press, 1953
3. Rachel Carson *The Edge of the Sea* Houghton Mifflin, 1955
4. Rachel Carson *Silent Spring* Houghton Mifflin, 1962
5. Linda Lear *Rachel Carson: The Life of the Author of Silent Spring* Penguin Group, 1997
6. William Souder *On a Farther Shore: The Life and Legacy of Rachel Carson* Crown Publishers, 2012



# Chapter 7

## JANE GOODALL

### 7.1 Growing up with a love of animals

Jane Goodall was born in 1934, in the London suburb of Chelsea. Both of her parents came from relatively wealthy families. Her father was an engineer, and later a racing car driver, while her mother was a writer.

When Jane was about a year old, she was given a toy chimpanzee called Jubilee, which had been made by the London Zoo to celebrate their first birth of a chimpanzee in captivity. Among her many later toys, Jubilee remained her favorite. Jane also had many pet animals, including racing snails, caterpillars, a lizard, guinea pigs, a hamster and a canary.

#### Fascination with Africa

At elementary school in Bournemouth, Jane became an avid reader. Her favorite books were *Doctor Doolittle*, *The Jungle Book*, and *Tarzan* - all three books involving people who were very close to animals and could communicate with them. Jane began to dream of one day going to Africa.

### 7.2 Africa, Leakey and the search for early human behavior

Jane's chance to visit Africa came in 1955, when a school friend invited her to visit her family's farm in Kenya. It was not until 1957 that Jane had saved enough money for the journey. She travelled by ship, and the journey took three weeks; but when she arrived, Africa was everything that she had dreamed of. To prolong her stay, Jane took an office job in Nairobi, where, by a stroke of luck, she met the paleontologist Louis Leakey.

Leakey was impressed by Jane's enthusiasm and by her extremely wide knowledge of natural history. He asked her to be his secretary, but what he really had in mind was to hire her to investigate the behavior of wild chimpanzees, the closest relatives of humans, hoping that it would cast light on the behavior of early humans.



Figure 7.1: Louis Leakey and Jane Goodall.



## 7.3 The Gombe research project

### Searching for hominid fossils

Before starting secretarial work for Louis Leakey, Jane spent some time with the paleontologist and his wife Mary searching for fossil hominids in Tanzania. It was on this expedition that Leakey made his final decision that Jane would be his team's chimpanzee researcher in Gombe Park, Kenya.

### Two women alone in the African bush

Following Leakey's advice, Jane returned to London in 1958 to consult with experts in the fields of primate anatomy and behavior. She was then 25 years old. By 1960, Leakey had raised enough money to fund her research, and she returned to Africa together with her mother, who stayed with her for the first few months. The two women were alone in the untamed wilderness. Gradually they became friends with the local fishermen and tribesmen. After her mother's departure, Jane (still more gradually) became accepted by Gombe Park's chimpanzees, to whom she gave names, an unusual practice at the time.

### Jane's key discoveries

- **Use of tools:** Jane discovered that chimpanzees make and use tools. For example, she observed a chimpanzee removing leaves from a twig in order to make an instrument for digging termites out of logs.
- **Hunting other animals and eating them:** Jane saw chimpanzees hunt and eat monkeys. Chimps had previously been thought to be vegetarians.
- **Chimpanzee troops wage war with rival troops:** Jane observed, for the first time, deadly territorial conflicts between chimpanzee troops. This observation casts troubling light on inherited human behavior.
- **Maternal behavior is learned:** Jane observed chimpanzee mothers teaching their daughters how to care for younger infants. She remarked, "We are not the only beings on the planet with personalities, thoughts, and - most importantly - feelings".
- **Hugging, kissing and body language:** Jane observed chimpanzees hugging and kissing each other, and using the same gestures that humans would use in similar situations. She states that "The nonverbal body language is the same for chimpanzees as it is for us. They use the same gestures and postures in the same context."



Figure 7.2: Jane Goodall with her husband, Baron Hugo van Lawick, a Dutch wildlife photographer sent to Gombe by The National Geographic.



Figure 7.3: Jane and Hugo with their son.





## 7.4 Roots and Shoots, and the Jane Goodall Institute

### Sponsored by The National Geographic

The National Geographic Society began to sponsor Jane Goodall's work, as well as publishing her articles in their magazine. In 1963, they published her first article, *My Life Among Wild Chimpanzees*. This article was soon followed by her book, *My friends, The Wild Chimpanzees*. A little later, a highly successful television series, *Miss Goodall and the Wild Chimpanzees*, made her work known to a very wide audience.

### A Ph.D. from Cambridge University

After she had made a number of important discoveries, Louis Leakey advised Jane Goodall that she ought to obtain an academic degree. This would make her ideas and observations more acceptable to the academic community. Following his advice, and with his help, she returned to England and enrolled as a Ph.D. student in ethology (the study of inherited behavior) at Cambridge University. She graduated in 1965 with a thesis entitled *Behavior of the Free-Ranging Chimpanzee*.

### A professor at Stanford and Dar es Salaam

Between 1970 and 1975, Jane Goodall held a professorship at Stanford University; and in 1973 she was appointed as an honorary visiting professor of zoology at the University of Dar es Salaam in Tanzania.

### *The Shadow of Man*

In 1971, Jane Goodall's important book, *The Shadow of Man* was published. Many other books followed, for example *The Chimpanzees of Gombe: Patterns of Behavior*, which was published in 1986, when Jane was 52 years old.

### The Jane Goodall Institute

In 1977, Jane Goodall founded an institute dedicated to the continuation of research work at Gombe and to the preservation of habitat for chimpanzees.

### A global youth organization for ecology

In 1991, Jane Goodall founded Roots and Shoots, a global environmental organization dedicated to improving the environment, for the sake of both people and animals. The organization has local chapters in over 140 countries, with over 8,000 local chapters worldwide.



Figure 7.4: Jane Goodall in Tanzania in 2018.



Figure 7.5: An award-winning documentary film about Jane Goodall's life and work makes use of beautiful footage filmed by her first husband, Baron Hugo van Lawick

## A few of of Jane Goodall's many awards and honors

- Gold Medal of Conservation from the San Diego Zoological Society in 1974
- J. Paul Getty Wildlife Conservation Prize in 1984
- Albert Schweitzer Medal of the Animal Welfare Institute in 1987
- National Geographic Society Centennial Award in 1988
- Kyoto Prize in Basic Sciences in 1990
- Tyler Prize for Environmental Achievement in 1997
- Gandhi-King Award in 2001
- United Nations Messenger of Peace in 2002
- Benjamin Franklin Medal in 2003
- Dame of the British Empire in 2003
- French Legion of Honor in 2006
- Grand Officer of the Order of Merit of the Italian Republic in 2011

## Books by Jane Goodall

- 1969 *My Friends the Wild Chimpanzees* Washington, DC: National Geographic Society
- 1971 *Innocent Killers (with H. van Lawick)*. Boston: Houghton Mifflin; London: Collins.
- 1971 *In the Shadow of Man* Boston: Houghton Mifflin; London: Collins. Published in 48 languages.
- 1986 *The Chimpanzees of Gombe: Patterns of Behavior* Boston: Bellknap Press of the Harvard University Press. Published also in Japanese and Russian.
- 1990 *Through a Window: 30 years observing the Gombe chimpanzees* London: Weidenfeld & Nicolson; Boston: Houghton Mifflin. Translated into more than 15 languages. 1991 Penguin edition, UK.
- 1991 *Visions of Caliban* (co-authored with Dale Peterson, PhD). Boston: Houghton Mifflin.
- 1999 *Brutal Kinship* (with Michael Nichols). New York: Aperture Foundation.
- 1999 *Reason For Hope; A Spiritual Journey* (with Phillip Berman). New York: Warner Books, Inc. Translated into Japanese and Portuguese.
- 2000 *40 Years At Gombe* New York: Stewart, Tabori, and Chang.
- 2000 *Africa In My Blood* (edited by Dale Peterson). New York: Houghton Mifflin Company.
- 2002 *The Ten Trusts: What We Must Do To Care for the Animals We Love* (with Marc Bekoff). San Francisco: Harper San Francisco
- 2005 *Harvest for Hope: A Guide to Mindful Eating* New York: Warner Books, Inc.
- 2009 *Hope for Animals and Their World: How Endangered Species Are Being Rescued from the Brink* Grand Central Publishing
- 2013 *Seeds of Hope: Wisdom and Wonder from the World of Plants* (with Gail Hudson) Grand Central Publishing

## Children's books by Jane Goodall

- 1972 *Grub: The Bush Baby* (with H. van Lawick). Boston: Houghton Mifflin.
- 1988 *My Life with the Chimpanzees* New York: Byron Preiss Visual Publications, Inc. Translated into French, Japanese and Chinese.
- 1989 *The Chimpanzee Family Book* Saxonville, MA: Picture Book Studio; Munich: Neugebauer Press; London: Picture Book Studio. Translated into more than 15 languages, including Japanese and Swahili.
- 1989 *Jane Goodall's Animal World: Chimps* New York: Macmillan.
- 1989 *Animal Family Series: Chimpanzee Family; Lion Family; Elephant Family; Zebra Family; Giraffe Family; Baboon Family; Hyena Family; Wildebeest Family* Toronto: Madison Marketing Ltd.
- 1994 *With Love* New York / London: North-South Books. Translated into German, French, Italian, and Japanese.
- 1999 *Dr. White* (illustrated by Julie Litty). New York: North-South Books.
- 2000 *The Eagle & the Wren* (illustrated by Alexander Reichstein). New York: North-South Books.
- 2001 *Chimpanzees I Love: Saving Their World and Ours* New York: Scholastic Press
- 2004 *Rickie and Henri: A True Story* (with Alan Marks) Penguin Young Readers Group

## Films

- 1965 *Miss Goodall and the Wild Chimpanzees* National Geographic Society
- 1975 *Miss Goodall: The Hyena Story* The World of Animal Behavior Series 16mm 1979 version for DiscoVision, not released for LaserDisc
- 1984 *Among the Wild Chimpanzees* National Geographic Special
- 1988 *People of the Forest* with Hugo van Lawick
- 1990 *Chimpanzee Alert* in the Nature Watch Series, Central Television
- 1990 *The Life and Legend of Jane Goodall* National Geographic Society.
- 1990 *The Gombe Chimpanzees* Bavarian Television
- 1995 *Fifi's Boys* for the Natural World series for the BBC
- 1996 *Chimpanzee Diary* for BBC2 Animal Zone
- 1997 *Animal Minds* for BBC
- Goodall voiced herself in the animated TV series *The Wild Thornberrys*.
- 2000 *Jane Goodall: Reason For Hope* PBS special produced by KTCA
- 2001 *Chimps R Us*, on season 11, episode 8. Scientific American Frontiers. Chedd-Angier Production Company.
- 2002 *Jane Goodall's Wild Chimpanzees* (IMAX format), in collaboration with Science North
- 2005 *Jane Goodall's Return to Gombe* for Animal Planet
- 2006 *Chimps, So Like Us* HBO film nominated for 1990 Academy Award
- 2007 *When Animals Talk We Should Listen*, theatrical documentary feature co-produced by Animal Planet

- 2010 *Jane's Journey*. theatrical documentary feature co-produced by Animal Planet
- 2012 *Chimpanzee*, theatrical nature documentary feature co-produced by Disneynature
- 2017 *Jane*, biographical documentary film National Geographic Studios, in association with Public Road Productions. The film is directed and written by Brett Morgen, music by Philip Glass

### Suggestions for further reading

1. Meg Greene Jane Goodall: A Biography Greenwood Publishing Group, 2005
2. Dale Peterson *Jane Goodall: The Woman who Redefined Man* Houghton Mifflin Harcourt, 2006
3. Lynn Margulis, Eduardo Punset *Mind, Life and Universe: Conversations with Great Scientists of Our Time* Chelsea Green Publishing, 2007
4. Goodall, Jane; Peterson, Dale. *Beyond Innocence: An Autobiography in Letters: The Later Years*. Houghton Mifflin Harcourt, (25 September 2002)

# Chapter 8

## HUMAN ECOLOGY

### 8.1 Paul R. Ehrlich and Anne H. Ehrlich

#### Education

Paul R. Ehrlich was born in 1932 in Philadelphia, Pennsylvania. He studied zoology at the University of Pennsylvania, and later received a Ph.D. from the University of Kansas, where he specialized in the study of insects. In 1959, Ehrlich joined the staff of Stanford University, where he was appointed to the Bing Professorship in Zoology in 1977.

#### Involvement in the population debate

In 1967, a lecture on population that Ehrlich gave at the Commonwealth Club of California was broadcast on the radio. Because of the publicity that followed the radio broadcast, Ehrlich was invited by the Sierra Club and Ballantine Books to write a book on the dangers of a human population explosion. Paul R. Ehrlich and his wife, Anne H. Ehrlich together wrote a book entitled *The Population Bomb*, which was published in 1968. Although the book was a joint husband and wife production, the publisher insisted that only Paul's name should appear as author. Although others had written about the dangers of overpopulation, it was this book that brought the problem to a wide audience.

#### Books by Paul R. Ehrlich

- *How to Know the Butterflies* (1960)
- *Process of Evolution* (1963)
- *Butterflies and Plants: A Study in Coevolution* (1964)
- *The Population Bomb* (1968, revised 1971, updated 1978, re-issued 1988, 1998, 2008 and 2018)
- *Population, Resources, Environments: Issues in Human Ecology* (1970)
- *How to Be a Survivor* (1971)
- *Man and the Ecosphere: Readings from Scientific American* (1971)

- *Population, Resources, Environments: Issues in Human Ecology* Second Edition (1972)
- *Human Ecology: Problems and Solutions* (1973)
- *Introductory Biology* (1973)
- *The End of Affluence* (1975)
- *Biology and Society* (1976)
- *Ecoscience: Population, Resources, Environment* (1978)
- *The Race Bomb* (1978)
- *Extinction* (1981)
- *The Golden Door: International Migration, Mexico, and the United States* (1981)
- *The Cold and the Dark: The World after Nuclear War* (1984, with Carl Sagan, Donald Kennedy, and Walter Orr Roberts)
- *The Machinery of Nature: The Living World Around Us and How it Works* (1986)
- *Earth* (1987, co-authored with Anne Ehrlich)
- *Science of Ecology* (1987, with Joan Roughgarden)
- *The Cassandra Conference: Resources and the Human Predicament* (1988)
- *The Birder's Handbook: A field Guide to the Natural History of North American Birds* (1988, with David S. Dobkin and Darryl Wheye)
- *New World, New Mind: Moving Towards Conscious Evolution* (1988, co-authored with Robert E. Ornstein)
- *The Population Explosion* (1990, with Anne Ehrlich)
- *Healing the Planet: Strategies for Resolving the Environmental Crisis* (1991, co-authored with Anne Ehrlich)
- *Birds in Jeopardy: The Imperiled and Extinct Birds of the United States and Canada, Including Hawaii and Puerto Rico* (1992, with David S. Dobkin and Darryl Wheye)
- *The Stork and the Plow : The Equity Answer to the Human Dilemma* (1995, with Anne Ehrlich and Gretchen C. Daily)
- *A World of Wounds: Ecologists and the Human Dilemma* (1997)
- *Betrayal of Science and Reason: How Anti-Environment Rhetoric Threatens Our Future* (1998, with Anne Ehrlich)
- *Wild Solutions: How Biodiversity is Money in the Bank* (2001, with Andrew Beattie)
- *Human Natures: Genes, Cultures, and the Human Prospect* (2002)
- *One With Nineveh: Politics, Consumption, and the Human Future* (2004, with Anne Ehrlich)
- *On the Wings of Checkerspots: A Model System for Population Biology* (2004, edited volume, co-edited with Ilkka Hanski)
- *The Dominant Animal: Human Evolution and the Environment* (2008, with Anne Ehrlich)
- *Humanity on a Tightrope: Thoughts on Empathy, Family, and Big Changes for a Viable Future* (2010, with Robert E. Ornstein)
- *Conservation Biology for All* (2010, edited volume, co-edited with Navjot S. Sodhi)
- *Hope on Earth: A Conversation* (2014, co-authored with Michael Charles Tobias)



Figure 8.1: **Paul R. Ehrlich in 1974.**

- *Killing the Koala and Poisoning the Prairie: Australia, America and the Environment* (2015, co-authored with Corey J. A. Bradshaw)
- *The Annihilation of Nature: Human Extinction of Birds and Mammals* (2015, with Anne Ehrlich and Gerardo Ceballos)



Figure 8.2: Ehrlich speaking in 2008.



Figure 8.3: Anne H. Ehrlich, Paul Ehrlich's wife, is the co-author of many of his books. I know her personally because of the many Pugwash Conferences that we both have attended. I also know John P. Holdren for the same reason,

## 8.2 John P. Holdren

### Education

John P. Holdren was born in Pennsylvania in 1944, but grew to in California. He graduated from MIT with a B.Sc. degree in 1965, and was awarded a Ph.D. by Stanford University in 1970, having studied aeronautics, astronautics and plasma physics.

### Professor of environmental science

Holdren taught for 13 years at Harvard, and later for more than 20 years at the University of California, Berkeley. His research interests centered on environmental questions. These included global environmental change, population stabilization, energy technologies and policies, ways to reduce the dangers from nuclear weapons and materials, and science and technology policy.

### Pugwash Conferences on Science and World Affairs

John P. Holdren served as the Chairman of the Executive Committee of Pugwash Conferences on Science and World Affairs. The Russell-Einstein Manifesto of 1955 called for a meeting of scientists from both sides of the Cold War to try to minimize the danger of a thermonuclear conflict. The first meeting took place at the summer home of the Canadian philanthropist Cyrus Eaton at the small village of Pugwash, Nova Scotia.

From this small beginning, a series of conferences developed, in which scientists, especially physicists, attempted to work for peace, and tried to address urgent global problems related to science, and especially to reduce the danger of a thermonuclear war. In 1995, Pugwash Conferences, and its president, Sir Joseph Rotblat, shared the Nobel Peace Prize. John P. Holdren delivered the acceptance speech on behalf of the organization.

## Some books and articles by John P. Holdren

Holdren has authored over 200 articles and papers and has co-authored and co-edited some 20 books and book-length reports including

- *Ecoscience : Population, Resources, Environment* by John P. Holdren, Paul R. Ehrlich, Ann H. Ehrlich
- *Global Ecology* by John P. Holdren and Paul R. Ehrlich
- *The Cassandra Conference : Resources and the Human Predicament* by John P. Holdren and Paul R. Ehrlich
- *Strategic Defense and the Future of the Arms Race : A Pugwash Symposium* by John P. Holdren
- *Energy* by John P. Holdren
- *Science in the White House*. Science, May 2009, 567.[
- *Policy for Energy Technology Innovation. Acting in Time on Energy Policy*, (with Laura Diaz Anadon, Max H. Bazerman, David T. Ellwood, Kelly Sims Gallagher, William H. Hogan, Henry Lee, and Daniel Schrag), Brookings Institution Press, 2009.
- *The Future of Climate Change Policy: The U.S.'s Last Chance to Lead*. Scientific American 2008 Earth 3.0 Supplement. October 13, 2008, 20-21.
- *Convincing the Climate Change Skeptics*. The Boston Globe, August 4, 2008.[
- *Ending the Energy Stalemate: A Bipartisan Strategy To Meet America's Energy Challenges*. Presentation at the National Academies 2008 Energy Summit, Washington, D.C., March 14, 2008.
- *Global Climatic Disruption: Risks and Opportunities*. Presentation at Investor Summit on Climate Risk, New York, February 14, 2008.
- *Meeting the Climate-Change Challenge*. The John H. Chafee Memorial Lecture, National Council for Science and the Environment, Washington, D.C., January 17, 2008.



Figure 8.4: John P. Holdren held the position of Assistant to the President for Science and Technology between 2009 and 2017.



Figure 8.5: John P. Holdren with Barack Obama.



Figure 8.6: John P. Holdren: “Trump has no science policy to speak of”.

## 8.3 Barry Commoner

### Early life and education

Barry Commoner (1917-2012) was born in Brooklyn, New York, the son of Jewish immigrants from Russia. After a B.Sc. from Columbia University, he received a doctoral degree in cell biology from Harvard. In 1947, he became a professor of plant physiology at Washington University, Sr. Louis. and he taught there for the next 34 years.

### A pioneer of ecology

While teaching at Washington University, Barry Commoner established the Center for the Biology of Natural Systems to study “the science of the total environment”. During the late 1950’s, Commoner’s attention was drawn to health and environmental consequences of nuclear testing. His Baby Tooth Survey demonstrated that radioactive substances, such as Strontium 90, were being incorporated in the teeth of infants as a result of the testing of nuclear weapons. Commoner wrote: “The greatest single cause of environmental contamination of this planet is radioactivity from test explosions of nuclear weapons in the atmosphere.”

### Barry Commoner’s US presidential campaign

In 1980, Barry Commoner founded the Citizens Party, and he ran as the party’s candidate for the US presidency. Although he received only a very small percentage of the votes in the election, the campaign nevertheless made a wide public aware of the seriousness of ecological problems. During the last phase of his career, Commoner returned to New York as a professor at Queens College, part of the City University of New York. Although he stepped down from his professorship in 2000, he remained a senior scientist at Queens College until his death in 2012 at the age of 95.

### Books and reports by Barry Commoner

- *Science and Survival* (1966), New York: Viking OCLC 225105 - on “the uses of science and technology in relation to environmental hazards”.
- *The Closing Circle: Nature, Man, and Technology* (1971), New York: Knopf.
- *The Poverty of Power: Energy and the Economic Crisis* (1976), New York: Random House.
- *The Politics of Energy* (1979), New York: Knopf.
- *Making Peace With the Planet* (1990), New York: Pantheon.
- *Long-range Air Transport of Dioxin from North American Sources to Ecologically Vulnerable Receptors in Nunavut, Arctic Canada*, (2000), Commoner, Barry; Bartlett, Paul Woods; Eisl, Holger; Couchot, Kim; Center for the Biology of Natural Systems, Queens College, City University of New York, published by the North American Commission for Environmental Cooperation, Montréal, Québec, Canada.

## A few things that Barry Commoner said or wrote

The proper use of science is not to conquer nature but to live in it.

Everything is connected to everything else. Everything must go somewhere. Nature knows best. There is no such thing as a free lunch.

If you ask what you are going to do about global warming, the only rational answer is to change the way in which we do transportation, energy production, agriculture and a good deal of manufacturing. The problem originates in human activity in the form of the production of goods.

The environmental crisis is somber evidence of an insidious fraud hidden in the vaunted productivity and wealth of modern, technology-based society. This wealth has been gained by rapid short-term exploitation of the environmental system, but it has blindly accumulated a debt to nature - a debt so large and so pervasive that in the next generation it may, if unpaid, wipe out most of the wealth it has gained us.

Our assaults on the ecosystem are so powerful, so numerous, so finely interconnected, that although the damage they do is clear, it is very difficult to discover how it was done. By which weapon? In whose hand? Are we driving the ecosphere to destruction simply by our growing numbers? By our greedy accumulation of wealth? Or are the machines which we have built to gain this wealth-the magnificent technology that now feeds us out of neat packages, that clothes us in man-made fibers, that surrounds us with new chemical creations-at fault?

The environmental crisis arises from a fundamental fault: our systems of production - in industry, agriculture, energy and transportation - essential as they are, make people sick and die.

Sooner or later, wittingly or unwittingly, we must pay for every intrusion on the natural environment.

Air pollution is not merely a nuisance and a threat to health. It is a reminder that our most celebrated technological achievements - the automobile, the jet plane, the power plant, industry in general, and indeed the modern city itself - are, in the environment, failures.

All of the clean technologies are known, it's a question of simply applying them.



Figure 8.7: Time reported in its February 1970 issue that "the national concern over the environment has reached an unprecedented level of intensity." On the cover, the visage of Barry Commoner projected a powerful image of ecology, which took the stage for the first time in the public eye.

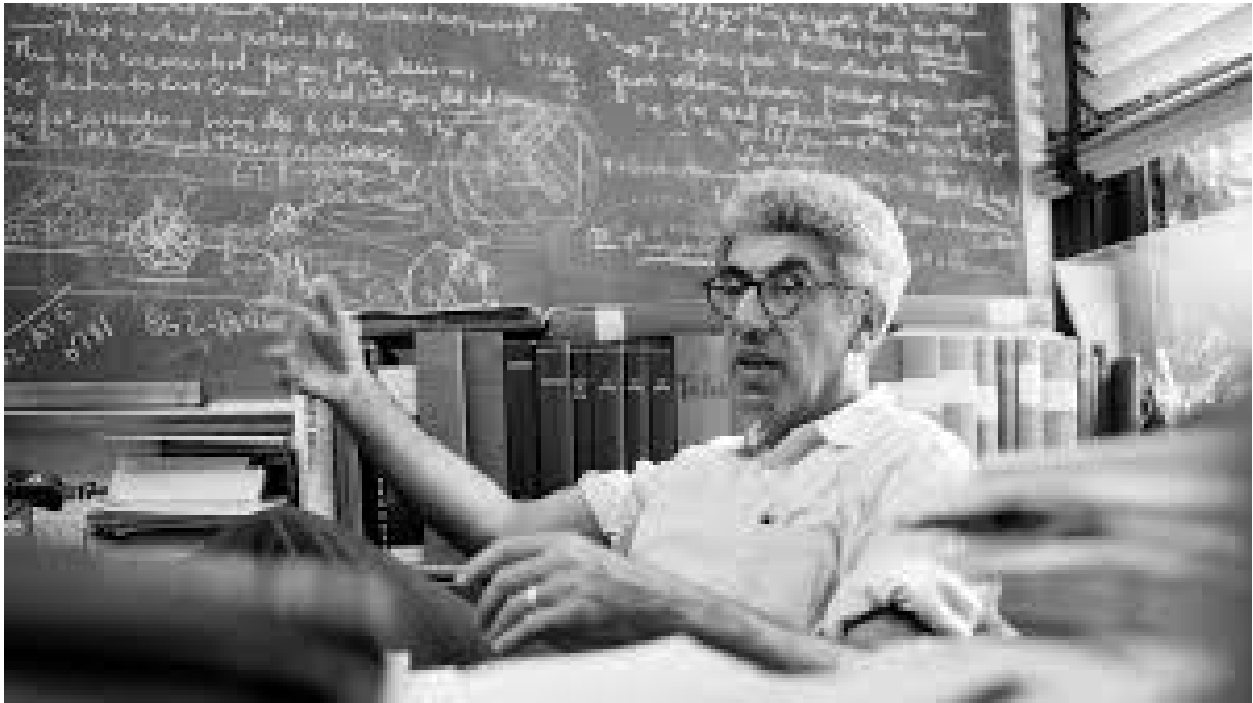
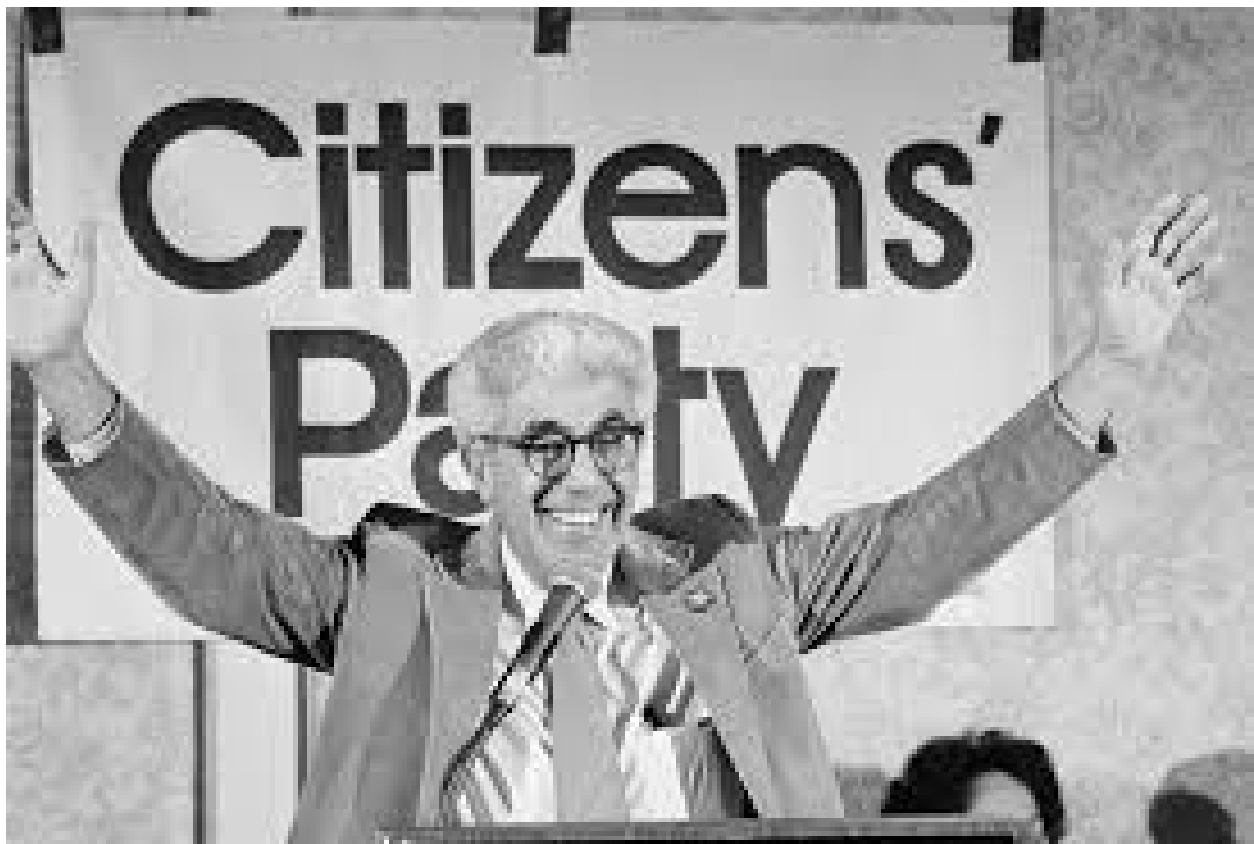


Figure 8.8: Barry Commoner died at the age of 95 in 2012.





The favorite statistic is that the U.S. contains 6 to 7% of the world population but consumes more than half the world's resources and is responsible for that fraction of the total environmental pollution. But this statistic hides another vital fact: that not everyone in the U.S. is so affluent.

Perhaps the simplest example is a synthetic plastic, which unlike natural materials, is not degraded by biological decay. It therefore persists as rubbish or is burned - in both cases causing pollution. In the same way, a substance such as DDT or lead, which plays no role in the chemistry of life and interferes with the actions of substances that do, is bound to cause ecological damage if sufficiently concentrated.

Because the global ecosystem is a connected whole, in which nothing can be gained or lost and which is not subject to over-all improvement, anything extracted from it by human effort must be replaced. Payment of this price cannot be avoided; it can only be delayed. The present environmental crisis is a warning that we have delayed nearly too long.

Despite the dazzling successes of modern technology and the unprecedented power of modern military systems, they suffer from a common and catastrophic fault. While providing us with a bountiful supply of food, with great industrial plants, with high-speed transportation, and with military weapons of unprecedented power, they threaten our very survival.

## 8.4 The global food and refugee crisis

“Unless progress with agricultural yields remains very strong, the next century will experience human misery that, on a sheer numerical scale, will exceed everything that has come before”

Nobel Laureate Norman Borlaug speaking of a global food crisis in the 21st century

As glaciers melt in the Himalayas, depriving India and China of summer water supplies; as sea levels rise, drowning the fertile rice fields of Viet Nam and Bangladesh; as drought threatens the productivity of grain-producing regions of North America; and as the end of the fossil fuel era impacts modern high-yield agriculture, there is a threat of wide-spread famine. There is a danger that the 1.5 billion people who are undernourished today will not survive an even more food-scarce future.

People threatened with famine will become refugees, desperately seeking entry into countries where food shortages are less acute. Wars, such as those currently waged in the Middle East, will add to the problem.

What can we do to avoid this crisis, or at least to reduce its severity? We must urgently address the problem of climate change; and we must shift money from military expenditure to the support of birth control programs and agricultural research. We must also replace the institution of war by a system of effective global governance and enforceable international laws.

### Optimum population in the distant future

What is the optimum population of the world? It is certainly not the maximum number that can be squeezed onto the globe by eradicating every species of plant and animal that cannot be eaten. The optimum global population is one that can be supported in comfort, equality and dignity - and with respect for the environment.

In 1848 (when there were just over one billion people in the world), John Stuart Mill described the optimal global population in the following words:

“The density of population necessary to enable mankind to obtain, in the greatest degree, all the advantages of cooperation and social intercourse, has, in the most populous countries, been attained. A population may be too crowded, although all be amply supplied with food and raiment.”

“... Nor is there much satisfaction in contemplating the world with nothing left to the spontaneous activity of nature; with every rood of land brought into cultivation, which is capable of growing food for human beings; every flowery waste or natural pasture plowed up, all quadrupeds or birds which are not domesticated for man’s use exterminated as his rivals for food, every hedgerow or superfluous tree rooted out, and scarcely a place left where a wild shrub or flower could grow without being eradicated as a weed in the name of improved agriculture. If the earth must lose that great portion of its pleasantness which it owes to things that the unlimited increase of wealth and population would extirpate from it, for the mere purpose of enabling it to support a larger, but not better or happier population, I sincerely hope, for the sake of posterity, that they will be content to be stationary, long before necessity compels them to it.”<sup>1</sup>

Has the number of humans in the world already exceeded the earth’s sustainable limits? Will the global population of humans crash catastrophically after having exceeded the carrying capacity of the environment? There is certainly a danger that this will happen - a danger that the 21st century will bring very large scale famines to vulnerable parts of the world, because modern energy-intensive agriculture will be dealt a severe blow by prohibitively high petroleum prices, and because climate change will reduce the world’s agricultural output. When the major glaciers in the Himalayas have melted, they will no longer be able to give India and China summer water supplies; rising oceans will drown much agricultural land; and aridity will reduce the output of many regions that now produce much of the world’s grain. Falling water tables in overdrawn aquifers, and loss of topsoil will add to the problem. We should be aware of the threat of a serious global food

---

<sup>1</sup>John Stuart Mill, *Principles of Political Economy, With Some of Their Applications to Social Philosophy*, (1848).

crisis in the 21st century if we are to have a chance of avoiding it.

The term *ecological footprint* was introduced by William Rees and Mathis Wackernagel in the early 1990's to compare demands on the environment with the earth's capacity to regenerate. In 2005, humanity used environmental resources at such a rate that it would take 1.3 earths to renew them. In other words, we have already exceeded the earth's carrying capacity. Since eliminating the poverty that characterizes much of the world today will require more resources per capita, rather than less, it seems likely that in the era beyond fossil fuels, the optimum global population will be considerably less than the present population of the world.

## Population growth and the Green Revolution

### Limitations on cropland

In 1944 the Norwegian-American plant geneticist Norman Borlaug was sent to Mexico by the Rockefeller Foundation to try to produce new wheat varieties that might increase Mexico's agricultural output. Borlaug's dedicated work on this project was spectacularly successful. He remained with the project for 16 years, and his group made 6,000 individual crossings of wheat varieties to produce high-yield disease-resistant strains.

In 1963, Borlaug visited India, bringing with him 100 kg. of seeds from each of his most promising wheat strains. After testing these strains in Asia, he imported 450 tons of the Lerma Rojo and Sonora 64 varieties - 250 tons for Pakistan and 200 for India. By 1968, the success of these varieties was so great that school buildings had to be commandeered to store the output. Borlaug's work began to be called a "Green Revolution". In India, the research on high-yield crops was continued and expanded by Prof. M.S. Swaminathan and his coworkers. The work of Green Revolution scientists, such Norman Borlaug and M.S. Swaminathan, has been credited with saving the lives of as many as a billion people.

Despite these successes, Borlaug believes that the problem of population growth is still a serious one. "Africa and the former Soviet republics", Borlaug states, "and the Cerrado<sup>2</sup>, are the last frontiers. After they are in use, the world will have no additional sizable blocks of arable land left to put into production, unless you are willing to level whole forests, which you should not do. So, future food-production increases will have to come from higher yields. And though I have no doubt that yields will keep going up, whether they can go up enough to feed the population monster is another matter. Unless progress with agricultural yields remains very strong, the next century will experience human misery that, on a sheer numerical scale, will exceed the worst of everything that has come before."

With regard to the prospect of increasing the area of cropland, a report by the United Nations Food and Agricultural Organization (*Provisional Indicative World Plan for Agricultural Development*, FAO, Rome, 1970) states that "In Southern Asia,... in some countries of Eastern Asia, in the Near East and North Africa... there is almost no scope for expanding agricultural area... In the drier regions, it will even be necessary to return to

---

<sup>2</sup> The Cerrado is a large savanna region of Brazil.

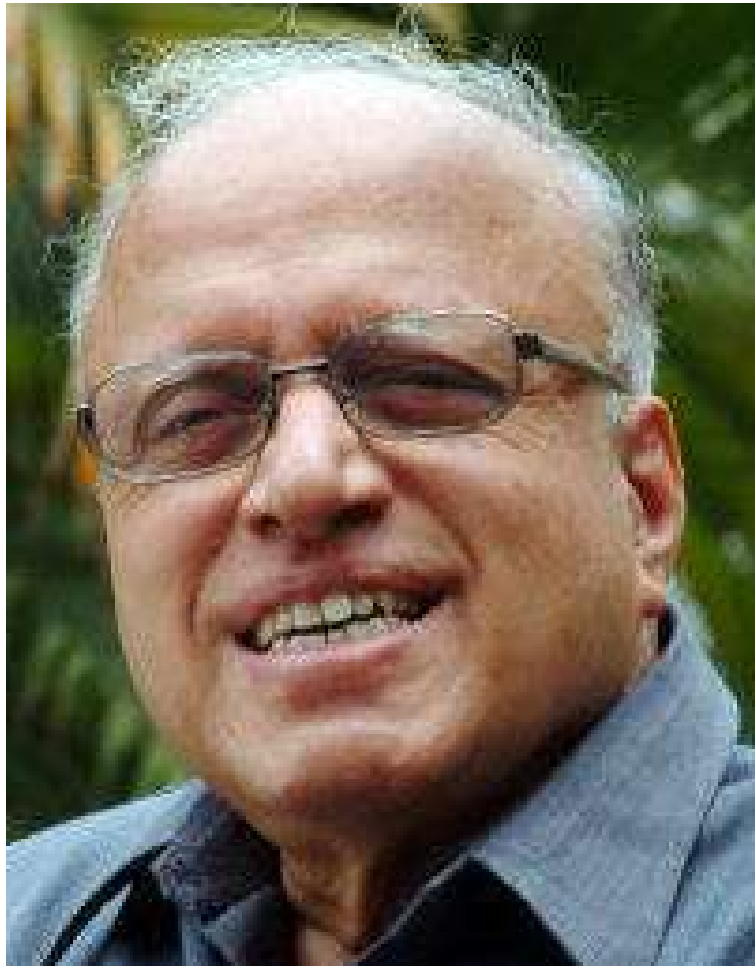


Figure 8.9: **Professor M.S. Swaminathan, father of the Green Revolution in India.** (Open and Shut7)



Figure 8.10: **Norman Borlaug and agronomist George Harrer in 1943.** (Human Wrongs Watch)

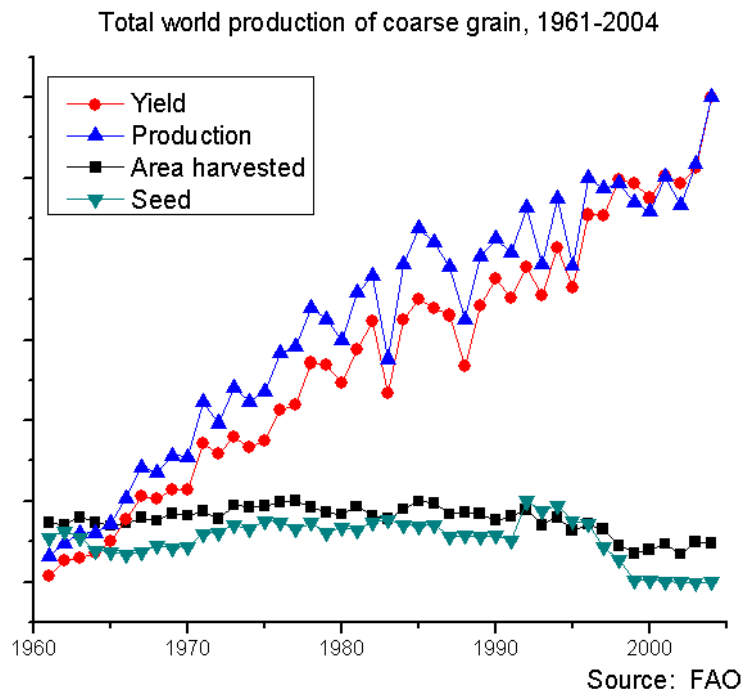


Figure 8.11: This graph shows the total world production of coarse grain between 1960 and 2004. Because of high-yield varieties, the yield of grain increased greatly. Notice, however, that the land under cultivation remained almost constant. High-yield agriculture depends on large inputs of fossil fuel energy and irrigation, and may be difficult to maintain in the future. (FAO)

permanent pasture the land that is marginal and submarginal for cultivation. In most of Latin America and Africa south of the Sahara, there are still considerable possibilities for expanding cultivated areas; but the costs of development are high, and it will often be more economical to intensify the utilization of areas already settled.” Thus there is a possibility of increasing the area of cropland in Africa south of the Sahara and in Latin America, but only at the cost of heavy investment and at the additional cost of destruction of tropical rain forests.

Rather than an increase in the global area of cropland, we may encounter a future loss of cropland through soil erosion, salination, desertification, loss of topsoil, depletion of minerals in topsoil, urbanization and failure of water supplies. In China and in the southwestern part of the United States, water tables are falling at an alarming rate. The Ogallala aquifer (which supplies water to many of the plains states in the central and southern parts of the United States) has a yearly overdraft of 160%.

In the 1950's, both the U.S.S.R and Turkey attempted to convert arid grasslands into wheat farms. In both cases, the attempts were defeated by drought and wind erosion, just as the wheat farms of Oklahoma were overcome by drought and dust in the 1930's.

If irrigation of arid lands is not performed with care, salt may be deposited, so that the land is ruined for agriculture. This type of desertification can be seen, for example, in some parts of Pakistan. Another type of desertification can be seen in the Sahel region of Africa, south of the Sahara. Rapid population growth in the Sahel has led to overgrazing, destruction of trees, and wind erosion, so that the land has become unable to support even its original population.

Especially worrying is a prediction of the International Panel on Climate Change concerning the effect of global warming on the availability of water: According to Model A1 of the IPCC, global warming may, by the 2050's, have reduced by as much as 30% the water available in large areas of world that now a large producers of grain<sup>3</sup>.

Added to the agricultural and environmental problems, are problems of finance and distribution. Famines can occur even when grain is available somewhere in the world, because those who are threatened with starvation may not be able to pay for the grain, or for its transportation. The economic laws of supply and demand are not able to solve this type of problem. One says that there is no “demand” for the food (meaning demand in the economic sense), even though people are in fact starving.

## Energy-dependence of modern agriculture

### Food prices and energy prices

A very serious problem with Green Revolution plant varieties is that they require heavy inputs of pesticides, fertilizers and irrigation. Because of this, the use of high-yield varieties contributes to social inequality, since only rich farmers can afford the necessary inputs. Monocultures, such as the Green Revolution varieties may also prove to be vulnerable to future epidemics of plant diseases, such as the epidemic that caused the Irish Potato

---

<sup>3</sup>See the discussion of the Stern Report in Chapter 7.

Famine in 1845. Even more importantly, pesticides, fertilizers and irrigation all depend on the use of fossil fuels. One must therefore ask whether high agricultural yields can be maintained in the future, when fossil fuels are expected to become prohibitively scarce and expensive.

Modern agriculture has become highly dependent on fossil fuels, especially on petroleum and natural gas. This is especially true of production of the high-yield grain varieties introduced in the Green Revolution, since these require especially large inputs of fertilizers, pesticides and irrigation. Today, fertilizers are produced using oil and natural gas, while pesticides are synthesized from petroleum feedstocks, and irrigation is driven by fossil fuel energy. Thus agriculture in the developed countries has become a process where inputs of fossil fuel energy are converted into food calories. If one focuses only on the farming operations, the fossil fuel energy inputs are distributed as follows:

1. Manufacture of inorganic fertilizer, 31%
2. Operation of field machinery, 19%
3. Transportation, 16%
4. Irrigation, 13%
5. Raising livestock (not including livestock feed), 8%
6. Crop drying, 5%
7. Pesticide production, 5%
8. Miscellaneous, 8%

The ratio of the fossil fuel energy inputs to the food calorie outputs depends on how many energy-using elements of food production are included in the accounting. David Pimental and Mario Giampietro of Cornell University estimated in 1994 that U.S. agriculture required 0.7 kcal of fossil fuel energy inputs to produce 1.0 kcal of food energy. However, this figure was based on U.N. statistics that did not include fertilizer feedstocks, pesticide feedstocks, energy and machinery for drying crops, or electricity, construction and maintenance of farm buildings. A more accurate calculation, including these inputs, gives an input/output ratio of approximately 1.0. Finally, if the energy expended on transportation, packaging and retailing of food is included, Pimental and Giampietro found that the input/output ratio for the U.S. food system was approximately 10, and this figure did not include energy used for cooking.

The Brundtland Report's <sup>4</sup> estimate of the global potential for food production assumes "that the area under food production can be around 1.5 billion hectares (3.7 billion acres

---

<sup>4</sup> World Commission on Environment and Development, *Our Common Future*, Oxford University Press, (1987). This book is often called "The Brundtland Report" after Gro Harlem Brundtland, the head of WCED, who was then Prime Minister of Norway.

- close to the present level), and that the average yields could go up to 5 tons of grain equivalent per hectare (as against the present average of 2 tons of grain equivalent).” In other words, the Brundtland Report assumes an increase in yields by a factor of 2.5. This would perhaps be possible if traditional agriculture could everywhere be replaced by energy-intensive modern agriculture using Green Revolution plant varieties. However, Pimental and Giampietro’s studies show that modern energy-intensive agricultural techniques cannot be maintained after fossil fuels have been exhausted.

At the time when the Brundtland Report was written (1987), the global average of 2 tons of grain equivalent per hectare included much higher yields from the sector using modern agricultural methods. Since energy-intensive petroleum-based agriculture cannot be continued in the post-fossil-fuel era, future average crop yields will probably be much less than 2 tons of grain equivalent per hectare.

The 1987 global population was approximately 5 billion. This population was supported by 3 billion tons of grain equivalent per year. After fossil fuels have been exhausted, the total world agricultural output is likely to be considerably less than that, and therefore the population that it will be possible to support will probably be considerably less than 5 billion, assuming that our average daily per capita use of food calories remains the same, and assuming that the amount of cropland and pasturage remains the same (1.5 billion hectares cropland, 3.0 billion hectares pasturage).

The Brundtland Report points out that “The present (1987) global average consumption of plant energy for food, seed and animal feed amounts to 6,000 calories daily, with a range among countries of 3,000-15,000 calories, depending on the level of meat consumption.” Thus there is a certain flexibility in the global population that can survive on a given total agricultural output. If the rich countries were willing to eat less meat, more people could be supported.

## **Effects of climate change on agriculture**

### **Effects of temperature increase on crops**

There is a danger that when climate change causes both temperature increases and increased aridity in regions like the US grain belt, yields will be very much lowered. Of the three main grain types (corn, wheat and rice) corn is the most vulnerable to the direct effect of increases in temperature. One reason for this is the mechanism of pollination of corn: A pollen grain lands on one end of a corn-silk strand, and the germ cell must travel the length of the strand in order to fertilize the kernel. At high temperatures, the corn silk becomes dried out and withered, and is unable to fulfill its biological function. Furthermore, heat can cause the pores on the underside of the corn leaf to close, so that photosynthesis stops.

According to a study made by Mohan Wali and coworkers at Ohio State University, the photosynthetic activity of corn increases until the temperature reaches 20 degrees Celsius. It then remains constant until the temperature reaches 35 degrees, after which it declines. At 40 degrees and above, photosynthesis stops altogether.

Scientists in the Philippines report that the pollination of rice fails entirely at 40 degrees Celsius, leading to crop failures. Wheat yields are also markedly reduced by temperatures in this range.

### **Predicted effects on rainfall**

According to the Stern Report, some of the major grain-producing areas of the world might lose up to 30% of their rainfall by 2050. These regions include much of the United States, Brazil, the Mediterranean region, Eastern Russia and Belarus, the Middle East, Southern Africa and Australia. Of course possibilities for agriculture may simultaneously increase in other regions, but the net effect of climate change on the world's food supply is predicted to be markedly negative.

### **Unsustainable use of groundwater**

It may seem surprising that fresh water can be regarded as a non-renewable resource. However, groundwater in deep aquifers is often renewed very slowly. Sometimes renewal requires several thousand years. When the rate of withdrawal of groundwater exceeds the rate of renewal, the carrying capacity of the resource has been exceeded, and withdrawal of water becomes analogous to mining a mineral. However, it is more serious than ordinary mining because water is such a necessary support for life.

In many regions of the world today, groundwater is being withdrawn faster than it can be replenished, and important aquifers are being depleted. In China, for example, groundwater levels are falling at an alarming rate. Considerations of water supply in relation to population form the background for China's stringent population policy.

At a recent lecture, Lester Brown of the Worldwatch Institute was asked by a member of the audience to name the resource for which shortages would most quickly become acute. Most of the audience expected him to name oil, but instead he replied "water". Lester Brown then cited China's falling water table. He predicted that within decades, China would be unable to feed itself. He said that this would not cause hunger in China itself: Because of the strength of China's economy, the country would be able to purchase grain on the world market. However Chinese purchases of grain would raise the price, and put world grain out of reach of poor countries in Africa. Thus water shortages in China will produce famine in parts of Africa, Brown predicted.

Under many desert areas of the world are deeply buried water tables formed during glacial periods when the climate of these regions was wetter. These regions include the Middle East and large parts of Africa. Water can be withdrawn from such ancient reservoirs by deep wells and pumping, but only for a limited amount of time.

In oil-rich Saudi Arabia, petroenergy is used to drill wells for ancient water and to bring it to the surface. Much of this water is used to irrigate wheat fields, and this is done to such an extent that Saudi Arabia exports wheat. The country is, in effect, exporting its ancient heritage of water, a policy that it may, in time, regret. A similarly short-sighted project



Figure 8.12: **Whitechuck Glacier in the North Cascades National Park in 1973.** (Nicholas College)

is Muammar Qaddafi's enormous pipeline, which will bring water from ancient sub-desert reservoirs to coastal cities of Libya.

In the United States, the great Ogallala aquifer is being overdrawn. This aquifer is an enormous stratum of water-saturated sand and gravel underlying parts of northern Texas, Oklahoma, New Mexico, Kansas, Colorado, Nebraska, Wyoming and South Dakota. The average thickness of the aquifer is about 70 meters. The rate of water withdrawal from the aquifer exceeds the rate of recharge by a factor of eight.

Thus we can see that in many regions, the earth's present population is living on its inheritance of water, rather than its income. This fact, coupled with rapidly increasing populations and climate change, may contribute to a food crisis partway through the 21st century.

### **Glacial melting and summer water supplies**

The summer water supplies of both China and India are threatened by the melting of glaciers. The Gangotri glacier, which is the principle glacier feeding India's great Ganges River, is reported to be melting at an accelerating rate, and it could disappear within a few decades. If this happens, the Ganges could become seasonal, flowing only during the monsoon season.

Chinese agriculture is also threatened by disappearing Himalayan glaciers, in this case those on the Tibet-Quinghai Plateau. The respected Chinese glaciologist Yao Tandong estimates that the glaciers feeding the Yangtze and Yellow Rivers are disappearing at the rate of 7% per year.

The Indus and Mekong Rivers will be similarly affected by the melting of glaciers. Lack of water during the summer season could have a serious impact on the irrigation of rice and wheat fields.



Figure 8.13: **The same glacier in 2006** (Nicholas College)

### Forest loss and climate change

Mature forests contain vast amounts of sequestered carbon, not only in their trees, but also in the carbon-rich soil of the forest floor. When a forest is logged or burned to make way for agriculture, this carbon is released into the atmosphere. One fifth of the global carbon emissions are at present due to destruction of forests. This amount is greater than the CO<sub>2</sub> emissions for the world's transportation systems.

An intact forest pumps water back into the atmosphere, increasing inland rainfall and benefiting agriculture. By contrast, deforestation, for example in the Amazonian rainforest, accelerates the flow of water back into the ocean, thus reducing inland rainfall. There is a danger that the Amazonian rainforest may be destroyed to such an extent that the region will become much more dry. If this happens, the forest may become vulnerable to fires produced by lightning strikes. This is one of the feedback loops against which the Stern Report warns - the drying and burning of the Amazonian rainforest may become irreversible, greatly accelerating climate change, if destruction of the forest proceeds beyond a certain point.

### Erosion of topsoil

Besides depending on an adequate supply of water, food production also depends on the condition of the thin layer of topsoil that covers the world's croplands. This topsoil is being degraded and eroded at an alarming rate: According to the World Resources Institute and the United Nations Environment Programme, "It is estimated that since World War II, 1.2 billion hectares... has suffered at least moderate degradation as a result of human activity. This is a vast area, roughly the size of China and India combined." This area is 27% of the total area currently devoted to agriculture <sup>5</sup>. The report goes on to say that the degradation is greatest in Africa.

---

<sup>5</sup>The total area devoted to agriculture throughout the world is 1.5 billion hectares of cropland and 3.0 billion hectares of pasturage.

The risk of topsoil erosion is greatest when marginal land is brought into cultivation, since marginal land is usually on steep hillsides which are vulnerable to water erosion when wild vegetation is removed.

David Pimental and his associates at Cornell University pointed out in 1995 that “Because of erosion-associated loss of productivity and population growth, the per capita food supply has been reduced over the past 10 years and continues to fall. The Food and Agricultural Organization reports that the per capita production of grains which make up 80% of the world’s food supply, has been declining since 1984.”

Pimental et al. add that “Not only is the availability of cropland per capita decreasing as the world population grows, but arable land is being lost due to excessive pressure on the environment. For instance, during the past 40 years nearly one-third of the world’s cropland (1.5 billion hectares) has been abandoned because of soil erosion and degradation. Most of the replacement has come from marginal land made available by removing forests. Agriculture accounts for 80% of the annual deforestation.”

Topsoil can also be degraded by the accumulation of salt when irrigation water evaporates. The worldwide area of irrigated land has increased from 8 million hectares in 1800 to more than 100 million hectares today. This land is especially important to the world food supply because it is carefully tended and yields are large in proportion to the area. To protect this land from salination, it should be irrigated in such a way that evaporation is minimized.

Finally cropland with valuable topsoil is being lost to urban growth and highway development, a problem that is made more severe by growing populations and by economic growth.

### **Laterization**

Every year, more than 100,000 square kilometers of rain forest are cleared and burned, an area which corresponds to that of Switzerland and the Netherlands combined. Almost half of the world’s tropical forests have already been destroyed. Ironically, the land thus cleared often becomes unsuitable for agriculture within a few years.

Tropical soils may seem to be fertile when covered with luxuriant vegetation, but they are usually very poor in nutrients because of leaching by heavy rains. The nutrients which remain are contained in the vegetation itself; and when the forest cover is cut and burned, the nutrients are rapidly lost.

Often the remaining soil is rich in aluminum oxide and iron oxide. When such soils are exposed to oxygen and sun-baking, a rocklike substance called Laterite is formed. The temples of Angkor Wat in Cambodia are built of Laterite; and it is thought that laterization of the soil contributed to the disappearance of the Khmer civilization, which built these temples.

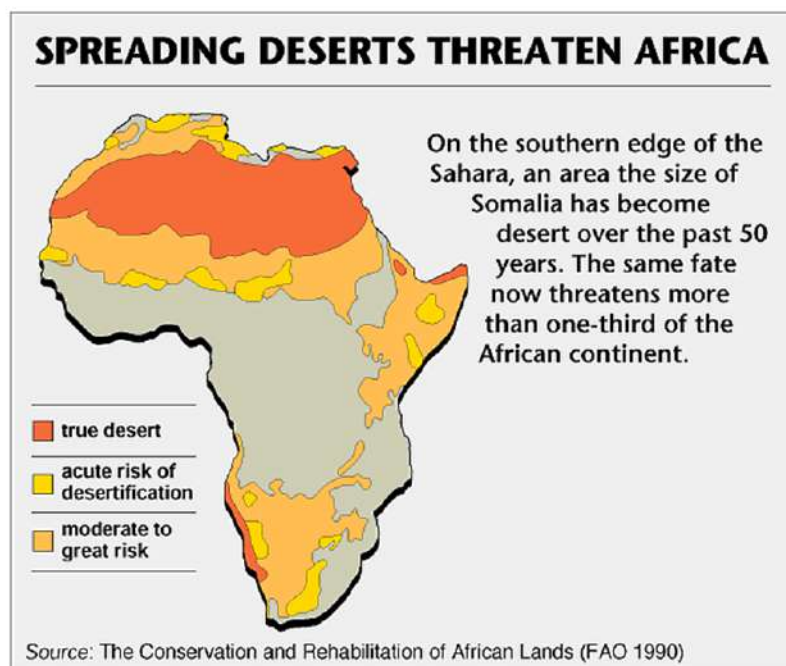


Figure 8.14: Desert regions of the Africa that are in danger of spreading. (FAO)

## Harmful effects of industrialized farming

A major global public health crisis may soon be produced by the wholesale use of antibiotics in the food of healthy farm animals. The resistance factors produced by shovelling antibiotics into animal food produces resistance factors (plasmids) which can easily be transferred to human pathogens. A related problem is the excessive use of pesticides and artificial fossil-fuel-derived fertilizers in agriculture. Pharming is not a joke. It is a serious threat.<sup>6</sup>

## Plasmids

Bacteria belong to a class of organisms (prokaryotes) whose cells do not have a nucleus. Instead, the DNA of the bacterial chromosome is arranged in a large loop. In the early 1950's, Joshua Lederberg discovered that bacteria can exchange genetic information. He

<sup>6</sup><http://ecowatch.com/2014/03/06/misuse-antibiotics-fatal-superbug-crisis/>  
<http://ecowatch.com/2013/12/06/8-scary-facts-about-antibiotic-resistance/>  
<http://ecowatch.com/2015/03/27/obama-fight-superbug-crisis/>  
<http://ecowatch.com/2014/03/12/fda-regulation-antibiotics-factory-farms/>  
<http://www.bbc.com/news/health-35153795>  
<http://www.bbc.com/news/health-21702647>  
<http://www.bbc.com/news/health-34857015>  
<http://sustainableagriculture.net/about-us/>  
<https://pwccc.wordpress.com/programa/>

found that a frequently-exchanged gene, the F-factor (which conferred fertility), was not linked to other bacterial genes; and he deduced that the DNA of the F-factor was not physically a part of the main bacterial chromosome. In 1952, Lederberg coined the word “plasmid” to denote any extrachromosomal genetic system.

In 1959, it was discovered in Japan that genes for resistance to antibiotics can be exchanged between bacteria; and the name “R-factors” was given to these genes. Like the F-factors, the R-factors did not seem to be part of the main loop of bacterial DNA.

Because of the medical implications of this discovery, much attention was focused on the R-factors. It was found that they were plasmids, small loops of DNA existing inside the bacterial cell, but not attached to the bacterial chromosome. Further study showed that, in general, between one percent and three percent of bacterial genetic information is carried by plasmids, which can be exchanged freely even between different species of bacteria.

In the words of the microbiologist, Richard Novick, “Appreciation of the role of plasmids has produced a rather dramatic shift in biologists’ thinking about genetics. The traditional view was that the genetic makeup of a species was about the same from one cell to another, and was constant over long periods of time. Now a significant proportion of genetic traits are known to be variable (present in some individual cells or strains, absent in others), labile (subject to frequent loss or gain) and mobile, all because those traits are associated with plasmids or other atypical genetic systems.”

Because of the ease with which plasmids conferring resistance to antibiotics can be transferred from animal bacteria to the bacteria carrying human disease, the practice of feeding antibiotics to healthy farm animals is becoming a major human health hazard. The World Health Organization has warned that if we lose effective antibiotics through this mechanism, “Many common infections will no longer have a cure, and could kill unabated”. The US Center for Disease Control has pointed to the emergence of “nightmare bacteria”, and the chief medical officer for England Prof Dame Sally Davies has evoked parallels with the “apocalypse”.

### **Pesticides, artificial fertilizers and topsoil**

A closely analogous danger results from the overuse of pesticides and petroleum-derived fertilizers in agriculture. A very serious problem with Green Revolution plant varieties is that they require heavy inputs of pesticides, fertilizers and irrigation. Because of this, the use of high-yield varieties contributes to social inequality, since only rich farmers can afford the necessary inputs. Monocultures, such as the Green Revolution varieties may also prove to be vulnerable to future plant diseases, such as the epidemic that caused the Irish Potato Famine in 1845. Even more importantly, pesticides, fertilizers and irrigation all depend on the use of fossil fuels. One must ask, therefore, whether high-yield agriculture can be maintained in the post-fossil-fuel era.

Topsoil is degraded by excessive use of pesticides and artificial fertilizers. Natural topsoil is rich in organic material, which contains sequestered carbon that would otherwise be present in our atmosphere in the form of greenhouse gases. In addition, natural topsoil



Figure 8.15: **Child suffering with the deficiency disease Marasmus in India.** (Public domain)

contains an extraordinarily rich diversity of bacteria and worms that act to convert agricultural wastes from one year's harvest into nutrients for the growth of next year's crop. Pesticides kill these vital organisms, and make the use of artificial fertilizers necessary.

Finally, many small individual farmers, whose methods are sustainable, are being eliminated by secret land-grabs or put out of business because they cannot compete with unsustainable high-yield agriculture. Traditional agriculture contains a wealth of knowledge and biodiversity, which it would be wise for the world to preserve.

## The demographic transition

The phrase "developing countries" is more than a euphemism; it expresses the hope that with the help of a transfer of technology from the industrialized nations, all parts of the world can achieve prosperity. Some of the forces that block this hope have just been mentioned. Another factor that prevents the achievement of worldwide prosperity is population growth.

In the words of Dr. Halfdan Mahler, former Director General of the World Health

Organization, “Country after country has seen painfully achieved increases in total output, food production, health and educational facilities and employment opportunities reduced or nullified by excessive population growth.”

The growth of population is linked to excessive urbanization, infrastructure failures and unemployment. In rural districts in the developing countries, family farms are often divided among a growing number of heirs until they can no longer be subdivided. Those family members who are no longer needed on the land have no alternative except migration to overcrowded cities, where the infrastructure is unable to cope so many new arrivals. Often the new migrants are forced to live in excrement-filled makeshift slums, where dysentery, hepatitis and typhoid are endemic, and where the conditions for human life sink to the lowest imaginable level. In Brazil, such shanty towns are called “favelas”.

If modern farming methods are introduced in rural areas while population growth continues, the exodus to cities is aggravated, since modern techniques are less labor-intensive and favor large farms. In cities, the development of adequate infrastructure requires time, and it becomes a hopeless task if populations are growing rapidly. Thus, population stabilization is a necessary first step for development.

It can be observed that birth rates fall as countries develop. However, development is sometimes blocked by the same high birth rates that economic progress might have prevented. In this situation (known as the “demographic trap”), economic gains disappear immediately because of the demands of an exploding population.

For countries caught in the demographic trap, government birth control programs are especially important, because one cannot rely on improved social conditions to slow birth rates. Since health and lowered birth rates should be linked, it is appropriate that family-planning should be an important part of programs for public health and economic development.

A recent study conducted by Robert F. Lapham of Demographic Health Surveys and W. Parker Maudlin of the Rockefeller Foundation has shown that the use of birth control is correlated both with socio-economic setting and with the existence of strong family-planning programs. The implication of this study is that even in the absence of increased living standards, family-planning programs can be successful, provided they have strong government support.

China, the world’s most populous nation, has adopted the somewhat draconian policy of allowing only one child for families in living in towns and cities (35.9% of the population). Chinese leaders obtained popular support for their one-child policy by means of an educational program which emphasized future projections of diminishing water resources and diminishing cropland per person if population increased unchecked. Like other developing countries, China has a very young population, which will continue to grow even when fertility has fallen below the replacement level because so many of its members are contributing to the birth rate rather than to the death rate. China’s present population is 1.3 billion. Its projected population for the year 2025 is 1.5 billion. China’s one-child policy is supported by 75% of the country’s people, but the methods of enforcement are sometimes criticized, and it has led to a M/F sex ratio of 1.17/1.00. The natural baseline for the sex ratio ranges between 1.03/1.00 and 1.07/1.00.



Figure 8.16: **Education of women and higher status for women are vitally important measures, not only for their own sake, but also because these social reforms have proved to be the key to lower birth rates.** (Kundan Srivastava)

Education of women and higher status for women are vitally important measures, not only for their own sake, but also because in many countries these social reforms have proved to be the key to lower birth rates. Religious leaders who oppose programs for the education of women and for family planning on “ethical” grounds should think carefully about the scope and consequences of the catastrophic global famine which will undoubtedly occur within the next 50 years if population is allowed to increase unchecked. Do these leaders really wish to be responsible for the suffering and death from starvation of hundreds of millions of people?

At the United Nations Conference on Population and Development, held in Cairo in September, 1994, a theme which emerged very clearly was that one of the most important keys to controlling the global population explosion is giving women better education and equal rights. These goals are desirable for the sake of increased human happiness, and for the sake of the uniquely life-oriented point of view which women can give us; but in addition, education and improved status for women have shown themselves to be closely connected with lowered birth rates. When women lack education and independent careers outside the home, they can be forced into the role of baby-producing machines by men who do not share in the drudgery of cooking, washing and cleaning; but when women have educational, legal, economic, social and political equality with men, experience has shown that they choose to limit their families to a moderate size.

Sir Partha Dasgupta of Cambridge University has pointed out that the changes needed to break the cycle of overpopulation and poverty are all desirable in themselves. Besides education and higher status for women, they include state-provided social security for old people, provision of water supplies near to dwellings, provision of health services to all, abolition of child labor and general economic development.

### **The UN Summit on Addressing Large Movements of Refugees and Migrants**

On September 19, 2016, the United Nations General Assembly held a 1-day summit meeting to address the pressing problem of refugees. It is a problem that has been made acute by armed conflicts in the Middle East and Africa, and by climate change.

One of the outcomes of the summit was the a Declaration for Refugees and Migrants. Here is a statement of the severity of the problem from paragraph 3 of the Declaration:

“We are witnessing in today’s world an unprecedented level of human mobility. More people than ever before live in a country other than the one in which they were born. Migrants are present in all countries of the world. Most of them move without incident. In 2015, their number surpassed 244 million, growing at a rate faster than the world’s population. However, there are 65 million forcibly displaced persons, including over 21 million refugees, 3 million asylum seekers and over 40 million internally displaced persons.”

Sadly, the world’s response to the tragic plight of refugees fleeing from zones of armed conflict has been less than generous. Men, women and many children, trying to escape from almost certain death in the war-torn Middle East, have been met, not with sympathy and kindness, but with barbed wire and tear gas.

Germany’s Chancellor, Angela Merkel, courageously made arrangements for her country to accept a large number of refugees, but as a consequence her party has suffered political setbacks. On the whole, European governments have moved to the right, as anti-refugee parties gained strength. The United States, Canada Australia and Russia, countries that could potentially save the lives of many refugees, have accepted almost none. In contrast, tiny Lebanon, despite all its problems, has become the home of so many refugees that they are a very large fraction of the country’s total population.

As the effects of climate change become more pronounced, we can expect the suffering and hopelessness of refugees to become even more severe. This is a challenge which the world must meet with humanity and solidarity.

### **The World Cities Report, 2016**

According to the World Cities Report<sup>7</sup>, by 2030, two thirds of the world’s population will be living in cities. As the urban population increases, the land area occupied by cities is increasing at a higher rate. It is projected that by 2030, the urban population of developing countries will double, while the area covered by cities could triple.

Commenting on this, the UN-Habitat Executive Director, Joan Clos, said: “In the twenty years since the Habitat II conference, the world has seen a gathering of its population in urban areas. This has been accompanied by socioeconomic growth in many instances. But the urban landscape is changing and with it, the pressing need for a cohesive and realistic approach to urbanization”.

“Such urban expansion is wasteful in terms of land and energy consumption and increases greenhouse gas emissions. The urban centre of gravity, at least for megacities, has shifted to the developing regions.”

---

<sup>7</sup><http://wcr.unhabitat.org/>

One can foresee that in the future, as fossil fuels become increasingly scarce, the problem of feeding urban populations will become acute.

### Suggestions for further reading

1. P. Dasgupta, *Population, Resources and Poverty*, *Ambio*, **21**, 95-101, (1992).
2. L.R. Brown, *Who Will Feed China?*, W.W. Norton, New York, (1995).
3. L.R. Brown, et al., *Saving the Planet. How to Shape and Environmentally Sustainable Global Economy*, W.W. Norton, New York, (1991).
4. L.R. Brown, *Postmodern Malthus: Are There Too Many of Us to Survive?*, *The Washington Post*, July 18, (1993).
5. L.R. Brown and H. Kane, *Full House. Reassessing the Earth's Population Carrying Capacity*, W.W. Norton, New York, (1991).
6. L.R. Brown, *Seeds of Change*, Praeger Publishers, New York, (1970).
7. L.R. Brown, *The Worldwide Loss of Cropland*, Worldwatch Paper 24, Worldwatch Institute, Washington, D.C., (1978).
8. L.R. Brown, and J.L. Jacobson, *Our Demographically Divided World*, Worldwatch Paper 74, Worldwatch Institute, Washington D.C., (1986).
9. L.R. Brown, and J.L. Jacobson, *The Future of Urbanization: Facing the Ecological and Economic Constraints*, Worldwatch Paper 77, Worldwatch Institute, Washington D.C., (1987).
10. L.R. Brown, and others, *State of the World*, W.W. Norton, New York, (published annually).
11. H. Brown, *The Human Future Revisited. The World Predicament and Possible Solutions*, W.W. Norton, New York, (1978).
12. H. Hanson, N.E. Borlaug and N.E. Anderson, *Wheat in the Third World*, Westview Press, Boulder, Colorado, (1982).
13. A. Dil, ed., *Norman Borlaug and World Hunger*, Bookservice International, San Diego/Islamabad/Lahore, (1997).
14. N.E. Borlaug, *The Green Revolution Revisited and the Road Ahead*, Norwegian Nobel Institute, Oslo, Norway, (2000).
15. N.E. Borlaug, *Ending World Hunger. The Promise of Biotechnology and the Threat of Antiscience Zealotry*, *Plant Physiology*, **124**, 487-490, (2000).
16. M. Giampietro and D. Pimental, *The Tightening Conflict: Population, Energy Use and the Ecology of Agriculture*, in *Negative Population Forum*, L. Grant ed., Negative Population Growth, Inc., Teaneck, N.J., (1993).
17. H.W. Kendall and D. Pimental, *Constraints on the Expansion of the Global Food Supply*, *Ambio*, **23**, 198-2005, (1994).
18. D. Pimental et al., *Natural Resources and Optimum Human Population*, *Population and Environment*, **15**, 347-369, (1994).
19. D. Pimental et al., *Environmental and Economic Costs of Soil Erosion and Conservation Benefits*, *Science*, **267**, 1117-1123, (1995).

20. D. Pimental et al., *Natural Resources and Optimum Human Population*, Population and Environment, **15**, 347-369, (1994).
21. D. Pimental and M. Pimental, *Food Energy and Society*, University Press of Colorado, Niwot, Colorado, (1996).
22. D. Pimental et al., *Environmental and Economic Costs of Soil Erosion and Conservation Benefits*, Science, **267**, 1117-1123, (1995).
23. RS and NAS, *The Royal Society and the National Academy of Sciences on Population Growth and Sustainability*, Population and Development Review, **18**, 375-378, (1992).
24. A.M. Altieri, *Agroecology: The Science of Sustainable Agriculture*, Westview Press, Boulder, Colorado, (1995).
25. G. Conway, *The Doubly Green Revolution*, Cornell University Press, (1997).
26. J. Dreze and A. Sen, *Hunger and Public Action*, Oxford University Press, (1991).
27. G. Bridger, and M. de Soissons, *Famine in Retreat?*, Dent, London, (1970).
28. W. Brandt, *World Armament and World Hunger: A Call for Action*, Victor Gollanz Ltd., London, (1982).
29. A.K.M.A. Chowdhury and L.C. Chen, *The Dynamics of Contemporary Famine*, Ford Foundation, Dacca, Pakistan, (1977)
30. J. Shepard, *The Politics of Starvation*, Carnegie Endowment for International Peace, Washington D.C., (1975).
31. M.E. Clark, *Ariadne's Thread: The Search for New Modes of Thinking*, St. Martin's Press, New York, (1989).
32. J.-C. Chesnais, *The Demographic Transition*, Oxford, (1992).
33. C.M. Cipola, *The Economic History of World Population*, Penguin Books Ltd., (1974).
34. E. Draper, *Birth Control in the Modern World*, Penguin Books, Ltd., (1972).
35. Draper Fund Report No. 15, *Towards Smaller Families: The Crucial Role of the Private Sector*, Population Crisis Committee, 1120 Nineteenth Street, N.W., Washington D.C. 20036, (1986).
36. E. Eckholm, *Losing Ground: Environmental Stress and World Food Prospects*, W.W. Norton, New York, (1975).
37. E. Havemann, *Birth Control*, Time-Life Books, (1967).
38. J. Jacobsen, *Promoting Population Stabilization: Incentives for Small Families*, Worldwatch Paper 54, Worldwatch Institute, Washington D.C., (1983).
39. N. Keyfitz, *Applied Mathematical Demography*, Wiley, New York, (1977).
40. W. Latz (ed.), *Future Demographic Trends*, Academic Press, New York, (1979).
41. World Bank, *Poverty and Hunger: Issues and Options for Food Security in Developing Countries*, Washington D.C., (1986).
42. J.E. Cohen, *How Many People Can the Earth Support?*, W.W. Norton, New York, (1995).
43. J. Amos, *Climate Food Crisis to Deepen*, BBC News (5 September, 2005).
44. J. Vidal and T. Ratford, *One in Six Countries Facing Food Shortage*, The Guardian, (30 June, 2005).
45. J. Mann, *Biting the Environment that Feeds Us*, The Washington Post, July 29, 1994.

46. G.R. Lucas, Jr., and T.W. Ogletree, (editors), *Lifeboat Ethics. The Moral Dilemmas of World Hunger*, Harper and Row, New York.
47. J.L. Jacobson, *Gender Bias: Roadblock to Sustainable Development*, Worldwatch Paper 110, Worldwatch Institute, Washington D.C., (1992).
48. J. Gever, R. Kaufmann, D. Skole and C. Vorosmarty, *Beyond Oil: The Threat to Food and Fuel in the Coming Decades*, Ballinger, Cambridge MA, (1986).
49. M. ul Haq, *The Poverty Curtain: Choices for the Third World*, Columbia University Press, New York, (1976).
50. H. Le Bras, *La Planète au Village*, Datar, Paris, (1993).
51. E. Mayr, *Population, Species and Evolution*, Harvard University Press, Cambridge, (1970).
52. D.C. Pirages and P.R. Ehrlich, *Ark II: Social Responses to Environmental Imperatives*, W.H. Freeman, San Francisco, (1974).
53. Population Reference Bureau, *World Population Data Sheet*, PRM, 777 Fourteenth Street NW, Washington D.C. 20007, (published annually).
54. R. Pressat, *Population*, Penguin Books Ltd., (1970).
55. M. Rechcigl (ed.), *Man/Food Equation*, Academic Press, New York, (1975).
56. J.C. Ryan, *Life Support: Conserving Biological Diversity*, Worldwatch Paper 108, Worldwatch Institute, Washington D.C., (1992).
57. J. Shepard, *The Politics of Starvation*, Carnegie Endowment for International Peace, Washington D.C., (1975).
58. P.B. Smith, J.D. Schilling and A.P. Haines, *Introduction and Summary*, in *Draft Report of the Pugwash Study Group: The World at the Crossroads*, Berlin, (1992).
59. B. Stokes, *Local Responses to Global Problems: A Key to Meeting Basic Human Needs*, Worldwatch Paper 17, Worldwatch Institute, Washington D.C., (1978).
60. L. Timberlake, *Only One Earth: Living for the Future*, BBC/ Earthscan, London, (1987).
61. UNEP, *Environmental Data Report*, Blackwell, Oxford, (published annually).
62. UNESCO, *International Coordinating Council of Man and the Biosphere*, MAB Report Series No. 58, Paris, (1985).
63. United Nations Fund for Population Activities, *A Bibliography of United Nations Publications on Population*, United Nations, New York, (1977).
64. United Nations Fund for Population Activities, *The State of World Population*, UNPF, 220 East 42nd Street, New York, 10017, (published annually).
65. United Nations Secretariat, *World Population Prospects Beyond the Year 2000*, U.N., New York, (1973).
66. J. van Klinken, *Het Dierde Punte*, Uitgiversmaatschappij J.H. Kok-Kampen, Netherlands (1989).
67. P.M. Vitousek, P.R. Ehrlich, A.H. Ehrlich and P.A. Matson, *Human Appropriation of the Products of Photosynthesis*, *Bioscience*, 34, 368-373, (1986).
68. B. Ward and R. Dubos, *Only One Earth*, Penguin Books Ltd., (1973).
69. WHO/UNFPA/UNICEF, *The Reproductive Health of Adolescents: A Strategy for Action*, World Health Organization, Geneva, (1989).

70. E.O. Wilson, *Sociobiology*, Harvard University Press, (1975).
71. E.O. Wilson (ed.), *Biodiversity*, National Academy Press, Washington D.C., (1988).
72. E.O. Wilson, *The Diversity of Life*, Allen Lane, The Penguin Press, London, (1992).
73. G. Woodwell (ed.), *The Earth in Transition: Patterns and Processes of Biotic Impoverishment*, Cambridge University Press, (1990).
74. World Commission on Environment and Development, *Our Common Future*, Oxford University Press, (1987).
75. World Bank, *Poverty and Hunger: Issues and Options for Food Security in Developing Countries*, Washington D.C., (1986).
76. World Resources Institute (WRI), *Global Biodiversity Strategy*, The World Conservation Union (IUCN), United Nations Environment Programme (UNEP), (1992).
77. World Resources Institute, *World Resources*, Oxford University Press, New York, (published annually).
78. J.E. Cohen, *How Many People Can the Earth Support?*, W.W. Norton, New York, (1995).
79. D.W. Pearce and R.K. Turner, *Economics of Natural Resources and the Environment*, Johns Hopkins University Press, Baltimore, (1990).
80. P. Bartelmus, *Environment, Growth and Development: The Concepts and Strategies of Sustainability*, Routledge, New York, (1994).
81. D. Pimental et al., *Natural Resources and Optimum Human Population*, Population and Environment, **15**, 347-369, (1994).
82. D. Pimentel and M. Pimentel, *Food Energy and Society*, University Press of Colorado, Niwot, Colorado, (1996).
83. H. Brown, *The Human Future Revisited. The World Predicament and Possible Solutions*, W.W. Norton, New York, (1978).
84. W. Jackson, *Man and the Environment*, Wm. C. Brown, Dubuque, Iowa, (1971).
85. Food and Agriculture Organization (FAO), *The Global Forest Assessment 2000* (Rome: Food and Agriculture Organization, Committee on Forestry, 2000).
86. Thomas K. Rudel, Kevin Flesher, Diana Bates, Sandra Baptista, and Peter Holmgren, *Tropical Deforestation Literature: Geographical and Historical Patterns*, *Unasylva* **203**, Vol. 51 (2000): 11-18;
87. Alexander S. Pfaff, *What drives deforestation in the Brazilian Amazon?* *Journal of Economics and Management* **37** (1999): 26-43.
88. Phillip M. Fearnside, *Human Carrying Capacity Estimation in Brazilian Amazonia as the Basis for Sustainable Development*, *Environmental Conservation* **24** (1997): 271-82;
89. Frederick A.B. Meyerson, *Human Population Density, Deforestation and Protected Areas Management: A Multi-scale Analysis of Central America, Guatemala*,
90. The Maya Biosphere Reserve, *Proceedings of the International Union for the Scientific Study of Population*, XXIV General Population Conference (Salvador, Brazil, 2001).
91. Millenium Ecosytem Assessment. 2005. *Ecosystems and Human Well-Being Biodiversity Synthesis*. Washington DC: World Resources Institute (WRI).

92. Sherbinin, A, D Carr, S Cassels and L Jiang. 2007. *Population and Environment*. The Annual Review of Environment and Resources **32**: 345-373.
93. Leahy, E, R Engelman, C Vogel, S Haddock and T Preston. 2007. *The Shape of Things to Come*. Washington, DC: PAI.
94. DeFries, R, T K Rudel, M Uriarte and M Hansen. 2010. *Deforestation Driven by Urban Population Growth and Agricultural Trade in the Twenty-First Century*. Nature Geoscience **3**: 178-181.
95. Lambin, E F and P Meyfroidt. 2011. *Global Land Use Change, Economic Globalization, and the Looming Land Scarcity*. Proceedings of the National Academy of Sciences **108**: 3465-3472.
96. United Nations Population Division. 2010. *World Urbanization Prospects: The 2009 Revision*. New York: UN Population Division.

## Chapter 9

# WANGARI MAATHAI

### 9.1 The life and work of Wangari Maathai

#### **Serving God by serving fellow human beings**

Wangari Muta Maathai (1940-2011) was the first African woman to win the Nobel Peace Prize. She was born in the highlands of Kenya, and attended a primary school before moving to St. Cecilia's Mission school at the age of 11. There she became a Catholic, and adopted the motto, "Serving God by serving fellow human beings".

#### **The Kennedy Airlift and study in the United States**

Wangari Maathai began her higher education in the United States. John F. Kennedy, who was then a US Senator, made funds from the Joseph P. Kennedy Foundation available to bring 300 promising African students to the United States for higher education. This program was nicknamed "The Kennedy Airlift". Maathai was among the students chosen, and she majored in biology with minors in chemistry and German at Benedictine College in Kansas. After receiving a B.Sc. degree in 1964, she studied at the University of Pittsburgh, receiving her M.Sc. in biological science in 1966.

#### **Professor at University College Nairobi**

Later, Maathai studied at the University of Nairobi, where she received a Ph.D. in veterinary anatomy in 1971. She had meanwhile met and married her husband, who became a member of the Kenyan Parliament on his second attempt. Through observation of the economic problems with which her husband was dealing, Maathai realized that they had their root in environmental degradation. In 1976 she was appointed as Associate Professor of Veterinary Science at University College, Nairobi.

## Founding the Green Belt Movement

Wangari Maathai had joined the National Council of Women of Kenya (NCWK) and had attended the United Nations Conference on the Human Environment (Habitat I) in Stockholm in 1972. In 1977, in a speech to the NCWK she proposed a program for the large-scale planting of trees in Kenya. The NCWK approved of this proposal, and the program started in 1977 came to be known as the Green Belt Movement. Its stated goal is “to mobilize community consciousness for self-determination, justice, equity, reduction of poverty, and environmental conservation, using trees as the entry point”. Since 1977, the organization has planted 51 million trees, and 30,000 women have been trained in forestry, food processing, bee-keeping, and other trades that help them earn income while preserving their lands and resources. Both men and women in Kenya have been motivated by the Green Belt Movement to prevent further environmental destruction and to restore that which has been damaged.

## Excerpts from Professor Maathai’s Nobel Lecture

...Although this prize comes to me, it acknowledges the work of countless individuals and groups across the globe. They work quietly and often without recognition to protect the environment, promote democracy, defend human rights and ensure equality between women and men. By so doing, they plant seeds of peace. I know they, too, are proud today. To all who feel represented by this prize I say use it to advance your mission and meet the high expectations the world will place on us.

This honour is also for my family, friends, partners and supporters throughout the world. All of them helped shape the vision and sustain our work, which was often accomplished under hostile conditions. I am also grateful to the people of Kenya - who remained stubbornly hopeful that democracy could be realized and their environment managed sustainably. Because of this support, I am here today to accept this great honour.

I am immensely privileged to join my fellow African Peace laureates, Presidents Nelson Mandela and F.W. de Klerk, Archbishop Desmond Tutu, the late Chief Albert Luthuli, the late Anwar el-Sadat and the UN Secretary General, Kofi Annan.

I know that African people everywhere are encouraged by this news. My fellow Africans, as we embrace this recognition, let us use it to intensify our commitment to our people, to reduce conflicts and poverty and thereby improve their quality of life. Let us embrace democratic governance, protect human rights and protect our environment. I am confident that we shall rise to the occasion. I have always believed that solutions to most of our problems must come from us.

In this year’s prize, the Norwegian Nobel Committee has placed the critical issue of environment and its linkage to democracy and peace before the

world. For their visionary action, I am profoundly grateful. Recognizing that sustainable development, democracy and peace are indivisible is an idea whose time has come. Our work over the past 30 years has always appreciated and engaged these linkages.

My inspiration partly comes from my childhood experiences and observations of Nature in rural Kenya. It has been influenced and nurtured by the formal education I was privileged to receive in Kenya, the United States and Germany. As I was growing up, I witnessed forests being cleared and replaced by commercial plantations, which destroyed local biodiversity and the capacity of the forests to conserve water.

Excellencies, ladies and gentlemen, In 1977, when we started the Green Belt Movement, I was partly responding to needs identified by rural women, namely lack of firewood, clean drinking water, balanced diets, shelter and income.

Throughout Africa, women are the primary caretakers, holding significant responsibility for tilling the land and feeding their families. As a result, they are often the first to become aware of environmental damage as resources become scarce and incapable of sustaining their families.

The women we worked with recounted that unlike in the past, they were unable to meet their basic needs. This was due to the degradation of their immediate environment as well as the introduction of commercial farming, which replaced the growing of household food crops. But international trade controlled the price of the exports from these small-scale farmers and a reasonable and just income could not be guaranteed. I came to understand that when the environment is destroyed, plundered or mismanaged, we undermine our quality of life and that of future generations.

Tree planting became a natural choice to address some of the initial basic needs identified by women. Also, tree planting is simple, attainable and guarantees quick, successful results within a reasonable amount time. This sustains interest and commitment.

So, together, we have planted over 30 million trees that provide fuel, food, shelter, and income to support their children's education and household needs. The activity also creates employment and improves soils and watersheds. Through their involvement, women gain some degree of power over their lives, especially their social and economic position and relevance in the family. This work continues...

Excellencies, friends, ladies and gentlemen, It is 30 years since we started this work. Activities that devastate the environment and societies continue unabated. Today we are faced with a challenge that calls for a shift in our thinking, so that humanity stops threatening its life-support system. We are called to assist the Earth to heal her wounds and in the process heal our own - indeed, to embrace the whole creation in all its diversity, beauty and wonder. This will happen if we see the need to revive our sense of belonging to a larger family of life, with which we have shared our evolutionary process.

**In the course of history, there comes a time when humanity is called to shift to a new level of consciousness, to reach a higher moral ground. A time when we have to shed our fear and give hope to each other. That time is now.**

### **Maathai's honors and awards**

- 1984: Right Livelihood Award
- 1986: Better World Society
- 1987: Global 500 Roll of Honour
- 1991: Goldman Environmental Prize
- 1991: The Hunger Project's Africa Prize for Leadership[87]
- 1993: Edinburgh Medal (for "Outstanding contribution to Humanity through Science")
- 1993: Jane Addams Leadership Award
- 1993: Benedictine College Offeramus Medal
- 1994: The Golden Ark Award
- 2001: The Juliet Hollister Award
- 2003: Global Environment Award, World Association of Non-Governmental Organizations
- 2004: Conservation Scientist Award from Columbia University
- 2004: J. Sterling Morton Award
- 2004: Petra Kelly Prize
- 2004: Sophie Prize
- 2004: Nobel Peace Prize
- 2006: Légion d'honneur
- 2006: Doctor of Public Service (honorary degree), University of Pittsburgh
- 2007: World Citizenship Award
- 2007: Livingstone Medal from Royal Scottish Geographical Society
- 2007: Indira Gandhi Prize
- 2007: Cross of the Order of St. Benedict
- 2008: The Elizabeth Blackwell Award from Hobart and William Smith Colleges
- 2009: NAACP Image Award - Chairman's Award (with Al Gore)
- 2009: Grand Cordon of the Order of the Rising Sun of Japan
- 2011: The Nichols-Chancellor's Medal awarded by Vanderbilt University
- 2013: Doctor of Science (honorary degree), Syracuse University, New York



Figure 9.1: Wangari Maathai (1940-2011). In 1977, she founded the Green Belt Movement in Kenya, an organization devoted to planting trees, environmental conservation and women's rights. Since that time, the organization has planted over 51 million trees. In 2004 she was awarded the Nobel Peace Prize for "her contribution to sustainable development, democracy and peace."



Figure 9.2: Maathai and then-U.S. Senator Barack Obama in Nairobi in 2006.

## 9.2 Illegal burning for palm oil plantations

According to a recent article published by the Union of Concerned Scientists, “One huge source of global warming emissions associated with palm oil is the draining and burning of the carbon-rich swamps known as peatlands. Peatlands can hold up to 18 to 28 times as much carbon as the forests above them; when they are drained and burned, both carbon and methane are released into the atmosphere - and unless the water table is restored, peatlands continue to decay and release global warming emissions for decades.

“As if that wasn’t bad enough, the burning of peatlands releases a dangerous haze into the air, resulting in severe health impacts and significant economic losses. Each year, more than 100,000 deaths in Southeast Asia can be attributed to particulate matter exposure from landscape fires, many of which are peat fires.

“Beyond its global warming and human health impacts, palm oil production also takes a toll on biodiversity and human rights. Only about 15 percent of native animal species can survive the transition from primary forest to plantation. Among the species vulnerable to palm oil expansion are orangutans, tigers, rhinoceros, and elephants. Furthermore, palm oil growers have also been accused of using forced labor, seizing land from local populations, and other human rights abuses.”

Licences to burn forests for palm oil plantations are often granted by corrupt government officials. Fortunately, through the efforts of NGO’s the public has become increasingly aware of the problem, and supermarkets are being urged to purchase products containing deforestation-free palm oil.

Another recent article<sup>1</sup> states that “Indonesia is being deforested faster than any other country in the world, and it has everything to do with one product: palm oil.

“According to a new study in the journal *Nature Climate Change*, deforestation in the Southeast Asian archipelago is nearly double the rate in the Amazon. Indonesia is said to have lost 840,000 hectares (3,250 square miles) of forest in 2012 while Brazil - which has four times Indonesia’s rainforest - lost a still-massive 460,000 hectares.

“The report’s authors found that government figures underestimated the true toll of forest clearing by as much as half. In the last 12 years, it’s possible that the destruction of one million hectares of ‘primary forest’ went unreported.

“The tree-killing spree is largely due to slashing and burning vegetation for the expansion of palm oil plantations to feed growing demand in countries like China and India. Americans and Europeans are still far and away the top consumers per capita - it’s estimated that palm oil can be found in roughly half the manufactured goods in any supermarket or drug store. Everything from peanut butter to soap to cosmetics contains the oil in its various forms.

“In Indonesia, where much of the land consists of carbon-rich soil known as peat, the problem is acute. Water-logged peat is commonly found in the jungles of Sumatra and Borneo, and merely exposing it to the air releases carbon dioxide into the atmosphere.”

---

<sup>1</sup><https://news.vice.com/article/indonesia-is-killing-the-planet-for-palm-oil>

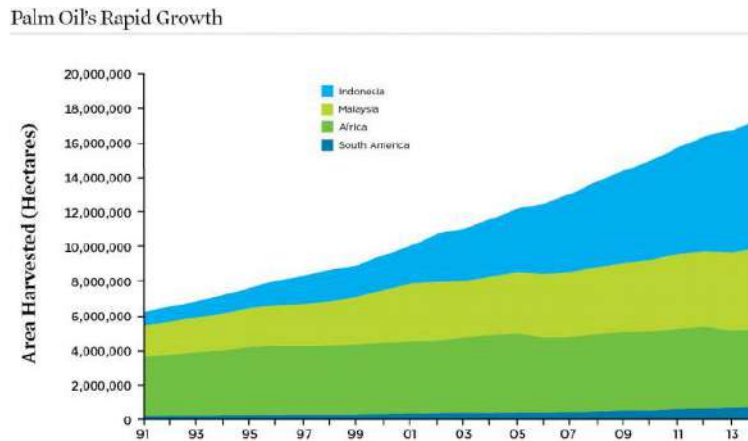


Figure 9.3: The growth of palm oil cultivation between 1993 and 2013. The dark area at the top of the graph indicates the dramatic growth of palm oil production in Southeast Asia, especially Indonesia.

## 9.3 Jair Bolsonaro's attack on the Amazon rainforest

### Beef is killing the rainforest

*Beef Production is Killing the Amazon Rainforest.* That is the title of an article published by [onegreenplanet.org](http://onegreenplanet.org)<sup>2</sup>. Here are some excerpts from the article

"The Amazon rainforest has been facing severe deforestation problems for several decades - it has lost about a fifth of its forest in the past three. While there are many causes, one of the main causes is cattle ranching, particularly in Brazil. Trees are cut and the land is converted into a pasture for cattle grazing. According to one report, an estimated 70 percent of deforestation in the Amazon basin can be attributed to cattle ranching. Using these numbers, cattle ranching in the Amazon has resulted in the loss of an area larger than the state of Washington.

"The government of Brazil offers loans of billions of dollars to support the expansion of its beef industry. Approximately 200 million pounds of beef is imported by the United States from Central America every year. While the chief importers of Brazilian beef were previously Europe and North America, nowadays Asian countries such as China and Russia consume more Brazilian beef than the European market. So, the demand is increasing day by day.

"With increasing population and increased per capita meat consumption, the rate of deforestation is increasing every day as well. It is expected that by 2018, the beef export will increase 93 percent, thereby increasing Brazil's beef market share of world exports to 61 percent. Beef is the most carbon-intensive form of meat production on the planet. The United Nations Food and Agriculture Organization finds that beef production gives rise to more greenhouse gases than the transportation industry."

<sup>2</sup><http://www.onegreenplanet.org/animalsandnature/beef-production-is-killing-the-amazon-rainforest/>

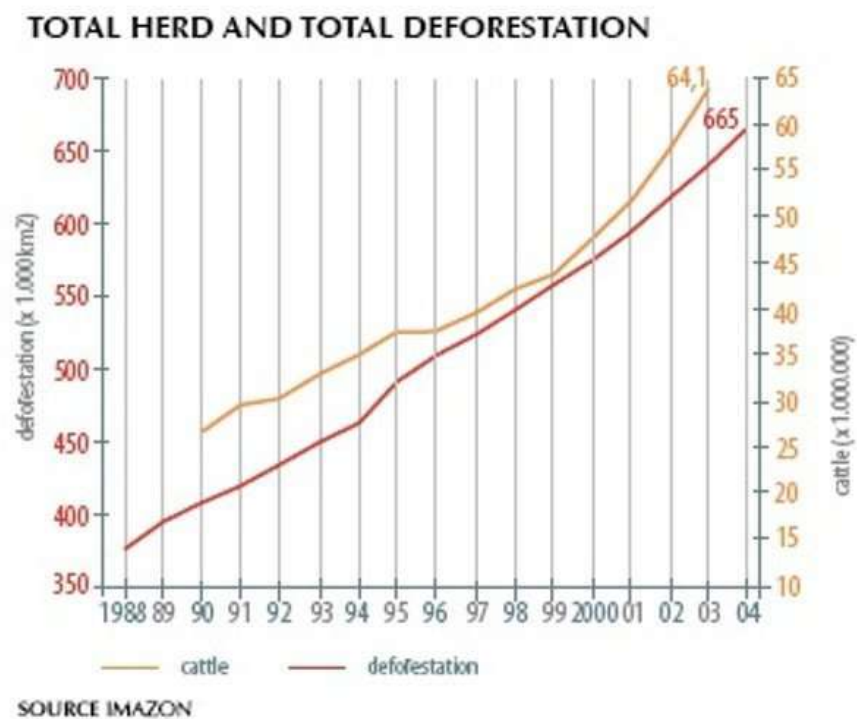


Figure 9.4: Total cattle herds and total deforestation in Amazonia between 1988 and 2004. Deforestation is measured in thousands of square kilometers, while herd size is measured in millions.

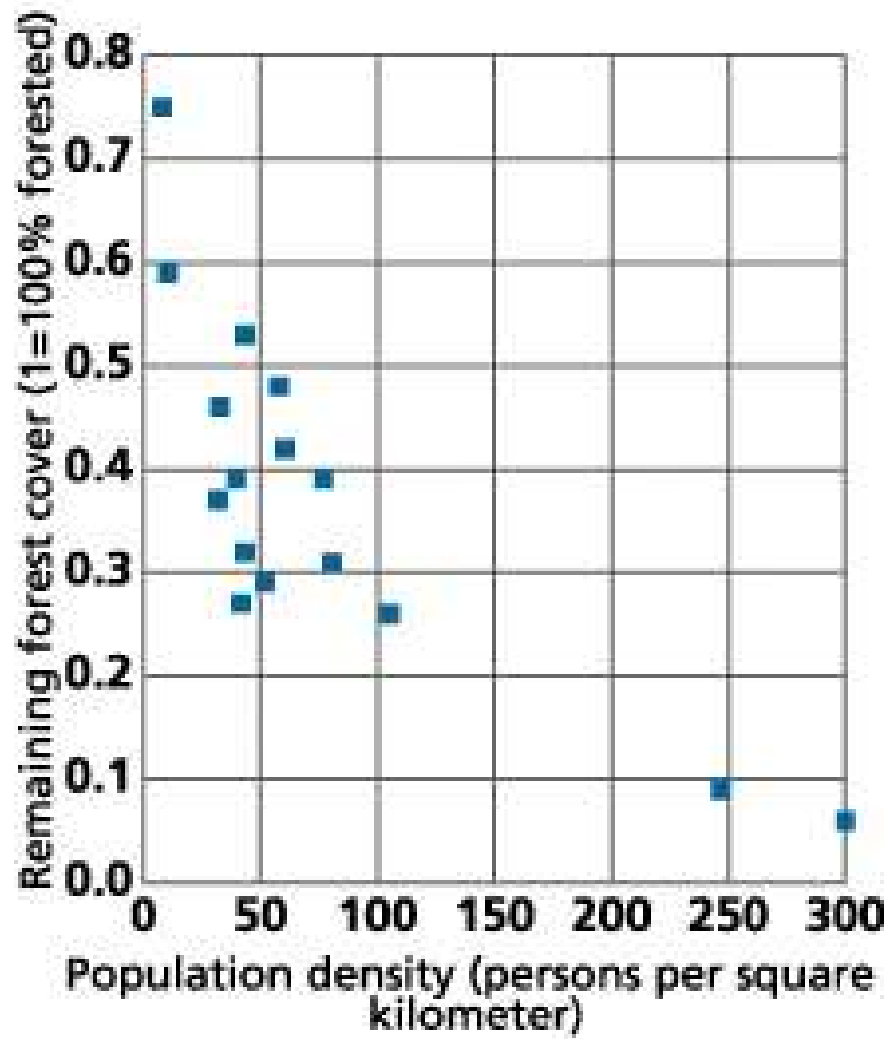


Figure 9.5: Population density and forest size.

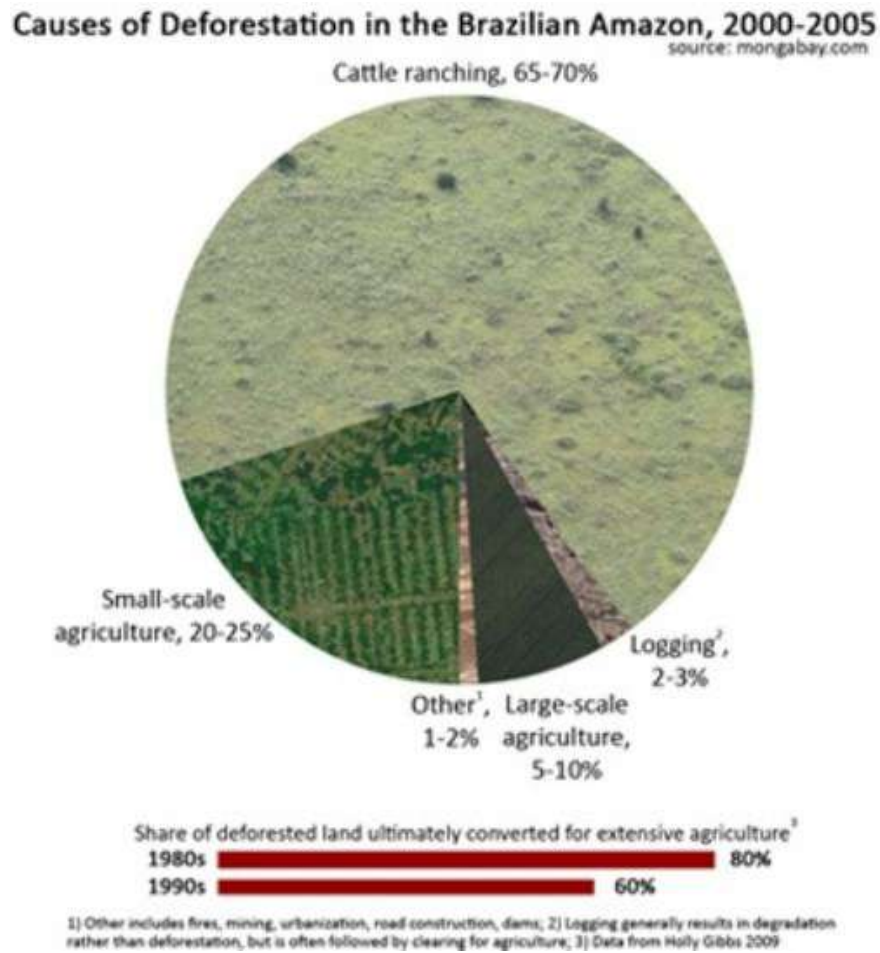


Figure 9.6: This figure shows the causes of Amazonian deforestation. The largest is beef production.

## Beef production and methane

A cow (or a bull) releases between 70 and 120 kg of methane per year. Methane is a greenhouse gas like carbon dioxide, but the negative effect on the climate of methane ( $\text{CH}_4$ ) is 23 times higher than the effect of  $\text{CO}_2$ . Therefore the release of about 100 kg methane per year for each cow is equivalent to about 2,300 kg  $\text{CO}_2$  per year.

World-wide, there are about 1.5 billion cows and bulls. All ruminants (animals which regurgitates food and re-chews it) on the world emit about two billion metric tons of  $\text{CO}_2$ , equivalents per year. In addition, clearing of tropical forests and rain forests to get more grazing land and farm land is responsible for an extra 2.8 billion metric tons of  $\text{CO}_2$  emission per year!

According to the Food and Agriculture Organization of the United Nations (FAO) agriculture is responsible for 18% of the total release of greenhouse gases world-wide (this is more than the whole transportation sector). Cattle-breeding is taking a major factor for these greenhouse gas emissions according to FAO. Says Henning Steinfeld, Chief of FAO's Livestock Information and Policy Branch and senior author of the report: "Livestock are one of the most significant contributors to today's most serious environmental problems. Urgent action is required to remedy the situation."

Livestock now use 30 percent of the earth's entire land surface, mostly permanent pasture but also including 33 percent of the global arable land used to producing feed for livestock, the report notes. As forests are cleared to create new pastures, it is a major driver of deforestation, especially in Latin America where, for example, some 70 percent of former forests in the Amazon have been turned over to grazing.

## Dietary changes can help

You and I can help to save our common future by changing our diets, especially by cutting out beef. Not only does beef production produce methane and destroy rainforests, it also requires much more land per calorie than other forms of agriculture. By switching from beef to other protein-rich foods, we not only substantially reduce greenhouse gas emissions, but we also shorten the food chain, so that more grain will be available to feed the world's growing population. Furthermore a changed diet with less meat would improve our health, since animal fats have been linked with heart disease, circulatory problems and strokes.

## 9.4 Growing populations and forest loss

Deforestation is occurring at alarming rates, especially in countries that have high levels of population growth.<sup>3</sup> The following table shows the forest loss in some countries where it is particularly high, together with their present and projected populations<sup>4</sup>. In the table, the

---

<sup>3</sup><http://www.prb.org/Publications/Articles/2004>

/PopulationGrowthandDeforestationACriticalandComplexRelationship.aspx

<sup>4</sup>Population Action International, *Why Population Matters to Forests*

annual rate of forest loss in the period 2000-2010. measured both in thousands of hectares and in percent. Populations in millions in 2010 are shown, together with projected populations in 2050.

country	forest loss	percent	pop. 2010	pop. 2050
Brazil	-2642	-0.49	194.9	222.8
Australia	-562	-0.37	22.3	31.4
Indonesia	-498	-0.51	239.9	293.5
Nigeria	-410	-3.67	158.4	389.6
Tanzania	-403	-1.13	44.8	138.3
Zimbabwe	-327	-1.88	12.6	20.6
Dem. Rep. Congo	.311	-0.20	66.0	148.5
Myanmar	-310	-0.93	47.9	55.3
Bolivia	-290	-0.49	9.9	16.8
Venezuela	-288	-0.60	28.0	41.8

The main mechanism through which rapid population growth is linked to forest loss is felling forests for the sake of agriculture.

Notice that Nigeria is losing 3.67% of its forests each year. The population of Nigeria is projected to more than double by 2050, but rising death rates from heat, famine and conflicts may prevent this. In general, rising death rates from these causes may ultimately lead populations in the tropics to decrease rather than increase.

Population Action International points out that “Deforestation threatens the well-being and livelihoods of millions of people who heavily depend on forest resources. It is particularly devastating for women and children in poor rural communities.” The organization recommends that information and materials for family planning be made available to all through universal provision of primary health care.

## 9.5 Desertification and soil erosion

The Princeton University Dictionary defines *desertification* as “the process of fertile land transforming into desert typically as a result of deforestation, drought or improper/inappropriate agriculture”. It is estimated that approximately a billion people are under threat from further expansions of deserts.

### Southward expansion of the Gobi desert

The Gobi desert is the fastest moving desert on earth. The rapid southward expansion of the Gobi is mainly due to human activities, such as overgrazing, deforestation and overuse

of water. Dust storms from the Gobi desert are becoming more and more frequent. Sand dunes are reportedly forming only 70 km north of Beijing.

## The Sahel

Another region in which the threat of desertification is extremely acute is the Sahel, which is the boundary between Africa's Sahara desert to the north and a region of savanna to the south. The Sahel stretches between the Atlantic Ocean and the Red Sea. During the last 50 years, the Sahel has lost approximately 650,000 km<sup>2</sup> of fertile land to the desert, and the boundary of the Sahara has moved 250 km southward.

The southward expansion of the Sahara has been caused partly by climate change, and partly by human activities. Growing human populations have put pressure on the fragile arid environment by overgrazing, tree-cutting for firewood and inappropriate agriculture.

## 9.6 Forest drying and wildfires: a feedback loop

When climate change produces aridity in a forested region, wildfires produced by lightning, stray sparks from falling stones, or human carelessness become increasingly likely. Forest fires contribute to global warming by releasing CO<sub>2</sub> into the atmosphere and by destroying climate-friendly tree-covered areas. Thus a dangerous feedback loop can be formed, and as was discussed in Chapter 4, with every feedback loop there is an associated tipping point. In the case of forest drying and wildfires, passing the tipping point means that forest cover will be lost irrevocably. We must avoid passing wildfire tipping points through human activities, such as the deliberate burning of rainforests for the sake of oil palm plantations.

## 9.7 Degraded forests are carbon emitters

According to an article published in the journal *Science* on 28 September, 2017<sup>5</sup>, degraded tropical forest throughout the world have stopped being carbon absorbers, and are now carbon emitters.

Reporting on the study, *The Guardian*,<sup>6</sup> noted that “Researchers found that forest areas in South America, Africa and Asia - which have until recently played a key role in absorbing greenhouse gases - are now releasing 425 teragrams of carbon annually, which is more than all the traffic in the United States.

“The study went further than any of its predecessors in measuring the impact of disturbance and degradation - the thinning of tree density and the culling of biodiversity below

---

<sup>5</sup>A. Baccini et al., *Tropical forests are a net carbon source based on aboveground measurements of gain and loss*, DOI: 10.1126/science.aam5962

<sup>6</sup><https://www.theguardian.com/environment/2017/sep/28/alarm-as-study-reveals-worlds-tropical-forests-are-huge-carbon-emission-source>

an apparently protected canopy - usually as a result of selective logging, fire, drought and hunting.

“Overall, more carbon was lost to degradation and disturbance than deforestation. The researchers stressed this was an opportunity as well as a concern because it was now possible to identify which areas are being affected and to restore forests before they disappeared completely.”

## 9.8 Replanting forests

Around the world, people interested in replanting forests can take inspiration from the Green Belt Movement, which was founded in 1977 by Wangari Maathai.

The Green Belt Movement organizes women in rural Africa to combat deforestation by planting trees. In this way they restore their main source of fuel for cooking, generate income and stop soil erosion. Since its foundation in 1977, the movement has planted 51 million trees. Over 30,000 women have been trained in forestry, food processing, bee-keeping, and other trades. The movement emphasizes economic justice and empowerment of women. This work is particularly valuable in regions of water scarcity, because besides preventing soil erosion, forests prevent the rapid run-off of water.

In order to combat climate change and to prevent southward expansion of the Sahara, the African Union has initiated a project called the Great Green Wall. The project aims at creating a mosaic of green and productive landscapes stretching across Africa, the Sahel region to the Horn of Africa, a strip of forested land 15 km wide and 7,500 km long, stretching from Dakar to Djibouti.

In China, the Green Great Wall project aims at preventing the expansion of the Gobi desert by planting a 4,500-kilometer-long windbreaking line of forests. The project is expected to be completed by 2050.

Reforestation initiatives also exist in other countries, for example in India, Lebanon, Philippines, Japan, Germany, Canada and the United States.



Figure 9.7: Nobel Laureate Wangari Maathai (1940-2011).



Figure 9.8: Wangari Maathai speaks about deforestation.

### Suggestions for further reading

1. C.H. Wood and David L. Skole, *Linking satellite, census, and survey data to study deforestation in the Brazilian Amazon*, in **People and Pixels**, ed. D. Liverman et al. (Washington, DC: National Academies Press, 1998).
2. Suzi Kerr, Alexander S. Pfaff, and Arturo Sanchez, *Development and Deforestation: Evidence From Costa Rica* (unpublished paper, 2003).
3. Frederick A.B. Meyerson, *Population, Biodiversity and Changing Climate*, Advances in Applied Biodiversity Science **4** (2003), Chapter 11 (2003): 83-90
4. Andrew D. Foster and Mark R. Rosenzweig, *Economic Growth and the Rise of Forests*, The Quarterly Journal of Economics (May 2003): 601-637.
5. A. Balmford et al., *Conservation Conflicts Across Africa*, Science **291** (2001): 2616-19.
6. Richard P. Cincotta, Jennifer Wisniewski, and Robert Engelman, *Human Population in the Biodiversity Hotspots*, Nature **404** (2000): 990-92.
7. Food and Agriculture Organization of the United Nations (FAO). 2010. *Global Forest Resources Assessment 2010*. Rome: FAO.
8. World Bank. 2004. *Sustaining Forests: A Development Strategy*. Washington DC: World Bank.
9. Food and Agriculture Organization of the United Nations (FAO). 2006. *Global Forest Resources Assessment 2005: Progress Towards Sustainable Forest Management*. Rome: FAO.
10. United Nations Population Division. 2009. *World Population Prospects: The 2008 Revision*. New York: UN Population Division.
11. Pan, W, D Carr, A Barbierri, R Bilsborrow and C Suchindran. 2007. *Forest Clearing in the Ecuadorian Amazon: A Study of Patterns Over Space and Time*. Population Research and Policy Review **26**:635-659.
12. Geist, H J and E F Lambin. 2002. *Proximate Causes and Underlying Driving Forces of Tropical Deforestation*. Bioscience **52(2)**: 143-150.
13. Rosero-Bixby, L and A Palloni. 1996. *Population and Deforestation in Costa Rica*. CDE Working Paper No. 96-19. Madison: 1996.
14. Carr, D, L Sutter and A Barbieri. 2006. *Population Dynamics and Tropical Deforestation: State of the Debate and Conceptual Challenges*. Population and Environment **27**:89-113.
15. Barreto, P, C Souza, R Nogueron, A Anderson, R Salamao and J Wiles. 2006. *Human Pressure on the Brazilian Amazon Forests*. Washington DC: World Resources Institute (WRI).
16. Ramankutty, N, JA Foley and NJ Olejniczak. 2002. *People on the Land: Changes in Global Population and Croplands during the 20th Century*. Ambio **31(3)**: 251-257.
17. Food and Agriculture Organization of the United Nations (FAO). 2008. *Forests and Energy: Key Issues*. Rome: FAO.



# Chapter 10

## POPE FRANCIS I

### 10.1 From Argentina to Rome

#### Early life in Argentina

His Holiness Pope Francis I was born in Buenos Aires, Argentina, in 1936. His original name was Jorge Mario Bergoglio, and both of his parents had emigrated from Italy to Argentina in order to escape from Mussolini's fascism. He was to become the first Pope from outside Europe since the Syrian Gregory II, who reigned in the 8th century.

#### Ordained as a priest

Jorge Bergoglio was ordained a Catholic priest in 1969. From 1973 to 1979 was Argentina's provincial superior of the Society of Jesus (Jesuits). He became the Archbishop of Buenos Aires in 1998. He made numerous journeys to Europe to study philosophy and languages. In 2001, Bergoglio was created a cardinal by Pope John Paul II.

#### A life of humility and simplicity

Throughout his career in the church, Bergoglio worked for the betterment of the poor, and chose for himself a life of humility and simplicity. In Argentina, he was known as the "slum archbishop" because of his work with poor slum-dwellers. When he was ordained Pope in 2013, he chose Francis as his papal name because of his admiration for the life and work of St. Francis of Assisi. In Rome, he does not live in the Papal Palace, but in a simple apartment, and he often travels to work by public transport.

## 10.2 Pope Francis addresses the climate emergency

In June, 2015, His Holiness Pope Francis I addressed the climate crisis in an encyclical entitled “*Laudato Si’*”<sup>1</sup>. Here are a few excerpts from this enormously important encyclical, which is addressed not only to the world’s 1.2 billion Catholics, but also to concerned people of all faiths. After reviewing the contributions of his predecessors, Pope Francis makes the following points:

**23.** The climate is a common good, belonging to all and meant for all. At the global level, it is a complex system linked to many of the essential conditions for human life. A very solid scientific consensus indicates that we are presently witnessing a disturbing warming of the climatic system. In recent decades this warming has been accompanied by a constant rise in the sea level and, it would appear, by an increase of extreme weather events, even if a scientifically determinable cause cannot be assigned to each particular phenomenon. Humanity is called to recognize the need for changes of lifestyle, production and consumption, in order to combat this warming or at least the human causes which produce or aggravate it. It is true that there are other factors (such as volcanic activity, variations in the earth’s orbit and axis, the solar cycle), yet a number of scientific studies indicate that most global warming in recent decades is due to the great concentration of greenhouse gases (carbon dioxide, methane, nitrogen oxides and others) released mainly as a result of human activity. As these gases build up in the atmosphere, they hamper the escape of heat produced by sunlight at the earth’s surface. The problem is aggravated by a model of development based on the intensive use of fossil fuels, which is at the heart of the worldwide energy system. Another determining factor has been an increase in changed uses of the soil, principally deforestation for agricultural purposes.

**24.** Warming has effects on the carbon cycle. It creates a vicious circle which aggravates the situation even more, affecting the availability of essential resources like drinking water, energy and agricultural production in warmer regions, and leading to the extinction of part of the planet’s biodiversity. The melting in the polar ice caps and in high altitude plains can lead to the dangerous release of methane gas, while the decomposition of frozen organic material can further increase the emission of carbon dioxide. Things are made worse by the loss of tropical forests which would otherwise help to mitigate climate change. Carbon dioxide pollution increases the acidification of the oceans and compromises the marine food chain. If present trends continue, this century may well witness extraordinary climate change and an unprecedented destruction of ecosystems, with serious consequences for all of us. A rise in the sea

---

<sup>1</sup><https://unfccc.int/news/pope-francis-releases-encyclical-on-climate-and-environment>



Figure 10.1: His Holiness Pope Francis I has delivered an extremely important encyclical addressing the urgent problem of climate change.



Figure 10.2: Pope Francis among the people at St. Peter's Square, 12 May, 2013 - "Papa Rock Star".



Figure 10.3: On April 16, 2019, Pope Francis met with teenage climate activist Greta Thunberg, and encouraged her to continue with he important work.

level, for example, can create extremely serious situations, if we consider that a quarter of the world's population lives on the coast or nearby, and that the majority of our megacities are situated in coastal areas.

25. Climate change is a global problem with grave implications: environmental, social, economic, political and for the distribution of goods. It represents one of the principal challenges facing humanity in our day. Its worst impact will probably be felt by developing countries in coming decades. Many of the poor live in areas particularly affected by phenomena related to warming, and their means of subsistence are largely dependent on natural reserves and ecosystemic services such as agriculture, fishing and forestry. They have no other financial activities or resources which can enable them to adapt to climate change or to face natural disasters, and their access to social services and protection is very limited. For example, changes in climate, to which animals and plants cannot adapt, lead them to migrate; this in turn affects the livelihood of the poor, who are then forced to leave their homes, with great uncertainty for their future and that of their children. There has been a tragic rise in the number of migrants seeking to flee from the growing poverty caused by environmental degradation. They are not recognized by international conventions as refugees; they bear the loss of the lives they have left behind, without enjoying any legal protection whatsoever. Sadly, there is widespread indifference to such suffering, which is even now taking place throughout our world. Our lack of response to these tragedies involving our brothers and sisters points to the loss of that sense of responsibility for our fellow men and women upon which all civil society is founded.

26. Many of those who possess more resources and economic or political power seem mostly to be concerned with masking the problems or concealing their symptoms, simply making efforts to reduce some of the negative impacts of climate change. However, many of these symptoms indicate that such effects will continue to worsen if we continue with current models of production and consumption. There is an urgent need to develop policies so that, in the next few years, the emission of carbon dioxide and other highly polluting gases can be drastically reduced, for example, substituting for fossil fuels and developing sources of renewable energy. Worldwide there is minimal access to clean and renewable energy. There is still a need to develop adequate storage technologies. Some countries have made considerable progress, although it is far from constituting a significant proportion. Investments have also been made in means of production and transportation which consume less energy and require fewer raw materials, as well as in methods of construction and renovating buildings which improve their energy efficiency. But these good practices are still far from widespread.

## II: THE ISSUE OF WATER

27. Other indicators of the present situation have to do with the depletion of natural resources. We all know that it is not possible to sustain the present level of consumption in developed countries and wealthier sectors of society, where the habit of wasting and discarding has reached unprecedented levels. The exploitation of the planet has already exceeded acceptable limits and we still have not solved the problem of poverty.

28. Fresh drinking water is an issue of primary importance, since it is indispensable for human life and for supporting terrestrial and aquatic ecosystems. Sources of fresh water are necessary for health care, agriculture and industry. Water supplies used to be relatively constant, but now in many places demand exceeds the sustainable supply, with dramatic consequences in the short and long term. Large cities dependent on significant supplies of water have experienced periods of shortage, and at critical moments these have not always been administered with sufficient oversight and impartiality. Water poverty especially affects Africa where large sectors of the population have no access to safe drinking water or experience droughts which impede agricultural production. Some countries have areas rich in water while others endure drastic scarcity.

29. One particularly serious problem is the quality of water available to the poor. Every day, unsafe water results in many deaths and the spread of water-related diseases, including those caused by microorganisms and chemical substances. Dysentery and cholera, linked to inadequate hygiene and water supplies, are a significant cause of suffering and of infant mortality. Underground water sources in many places are threatened by the pollution produced in certain mining, farming and industrial activities, especially in countries lacking adequate regulation or controls. It is not only a question of industrial waste. Detergents and chemical products, commonly used in many places of the world, continue to pour into our rivers, lakes and seas.

30. Even as the quality of available water is constantly diminishing, in some places there is a growing tendency, despite its scarcity, to privatize this resource, turning it into a commodity subject to the laws of the market. Yet access to safe drinkable water is a basic and universal human right, since it is essential to human survival and, as such, is a condition for the exercise of other human rights. Our world has a grave social debt towards the poor who lack access to drinking water, because they are denied the right to a life consistent with their inalienable dignity. This debt can be paid partly by an increase in funding to provide clean water and sanitary services among the poor. But water continues to be wasted, not only in the developed world but also in developing countries which possess it in abundance. This shows that the problem of

water is partly an educational and cultural issue, since there is little awareness of the seriousness of such behaviour within a context of great inequality.

31. Greater scarcity of water will lead to an increase in the cost of food and the various products which depend on its use. Some studies warn that an acute water shortage may occur within a few decades unless urgent action is taken. The environmental repercussions could affect billions of people; it is also conceivable that the control of water by large multinational businesses may become a major source of conflict in this century.

### III: LOSS OF BIODIVERSITY

32. The earth's resources are also being plundered because of short-sighted approaches to the economy, commerce and production. The loss of forests and woodlands entails the loss of species which may constitute extremely important resources in the future, not only for food but also for curing disease and other uses. Different species contain genes which could be key resources in years ahead for meeting human needs and regulating environmental problems.

33. It is not enough, however, to think of different species merely as potential "resources" to be exploited, while overlooking the fact that they have value in themselves. Each year sees the disappearance of thousands of plant and animal species which we will never know, which our children will never see, because they have been lost for ever. The great majority become extinct for reasons related to human activity. Because of us, thousands of species will no longer give glory to God by their very existence, nor convey their message to us. We have no such right.

34. It may well disturb us to learn of the extinction of mammals or birds, since they are more visible. But the good functioning of ecosystems also requires fungi, algae, worms, insects, reptiles and an innumerable variety of microorganisms. Some less numerous species, although generally unseen, nonetheless play a critical role in maintaining the equilibrium of a particular place. Human beings must intervene when a geosystem reaches a critical state. But nowadays, such intervention in nature has become more and more frequent. As a consequence, serious problems arise, leading to further interventions; human activity becomes ubiquitous, with all the risks which this entails. Often a vicious circle results, as human intervention to resolve a problem further aggravates the situation. For example, many birds and insects which disappear due to synthetic agrotoxins are helpful for agriculture: their disappearance will have to be compensated for by yet other techniques which may well prove harmful. We must be grateful for the praiseworthy efforts being made by scientists and engineers dedicated to finding solutions to man-made problems. But a sober

look at our world shows that the degree of human intervention, often in the service of business interests and consumerism, is actually making our earth less rich and beautiful, ever more limited and grey, even as technological advances and consumer goods continue to abound limitlessly. We seem to think that we can substitute an irreplaceable and irretrievable beauty with something which we have created ourselves.

35. In assessing the environmental impact of any project, concern is usually shown for its effects on soil, water and air, yet few careful studies are made of its impact on biodiversity, as if the loss of species or animals and plant groups were of little importance. Highways, new plantations, the fencing-off of certain areas, the damming of water sources, and similar developments, crowd out natural habitats and, at times, break them up in such a way that animal populations can no longer migrate or roam freely. As a result, some species face extinction. Alternatives exist which at least lessen the impact of these projects, like the creation of biological corridors, but few countries demonstrate such concern and foresight. Frequently, when certain species are exploited commercially, little attention is paid to studying their reproductive patterns in order to prevent their depletion and the consequent imbalance of the ecosystem.

36. Caring for ecosystems demands far-sightedness, since no one looking for quick and easy profit is truly interested in their preservation. But the cost of the damage caused by such selfish lack of concern is much greater than the economic benefits to be obtained. Where certain species are destroyed or seriously harmed, the values involved are incalculable. We can be silent witnesses to terrible injustices if we think that we can obtain significant benefits by making the rest of humanity, present and future, pay the extremely high costs of environmental deterioration.

37. Some countries have made significant progress in establishing sanctuaries on land and in the oceans where any human intervention is prohibited which might modify their features or alter their original structures. In the protection of biodiversity, specialists insist on the need for particular attention to be shown to areas richer both in the number of species and in endemic, rare or less protected species. Certain places need greater protection because of their immense importance for the global ecosystem, or because they represent important water reserves and thus safeguard other forms of life.

38. Let us mention, for example, those richly biodiverse lungs of our planet which are the Amazon and the Congo basins, or the great aquifers and glaciers. We know how important these are for the entire earth and for the future of humanity. The ecosystems of tropical forests possess an enormously complex

biodiversity which is almost impossible to appreciate fully, yet when these forests are burned down or levelled for purposes of cultivation, within the space of a few years countless species are lost and the areas frequently become arid wastelands. A delicate balance has to be maintained when speaking about these places, for we cannot overlook the huge global economic interests which, under the guise of protecting them, can undermine the sovereignty of individual nations. In fact, there are “proposals to internationalize the Amazon, which only serve the economic interests of transnational corporations”. We cannot fail to praise the commitment of international agencies and civil society organizations which draw public attention to these issues and offer critical cooperation, employing legitimate means of pressure, to ensure that each government carries out its proper and inalienable responsibility to preserve its country’s environment and natural resources, without capitulating to spurious local or international interests.

39. The replacement of virgin forest with plantations of trees, usually monocultures, is rarely adequately analyzed. Yet this can seriously compromise a biodiversity which the new species being introduced does not accommodate. Similarly, wetlands converted into cultivated land lose the enormous biodiversity which they formerly hosted. In some coastal areas the disappearance of ecosystems sustained by mangrove swamps is a source of serious concern.

40. Oceans not only contain the bulk of our planet’s water supply, but also most of the immense variety of living creatures, many of them still unknown to us and threatened for various reasons. What is more, marine life in rivers, lakes, seas and oceans, which feeds a great part of the world’s population, is affected by uncontrolled fishing, leading to a drastic depletion of certain species. Selective forms of fishing which discard much of what they collect continue unabated. Particularly threatened are marine organisms which we tend to overlook, like some forms of plankton; they represent a significant element in the ocean food chain, and species used for our food ultimately depend on them.

41. In tropical and subtropical seas, we find coral reefs comparable to the great forests on dry land, for they shelter approximately a million species, including fish, crabs, molluscs, sponges and algae. Many of the world’s coral reefs are already barren or in a state of constant decline. “Who turned the wonder-world of the seas into underwater cemeteries bereft of colour and life?” This phenomenon is due largely to pollution which reaches the sea as the result of deforestation, agricultural monocultures, industrial waste and destructive fishing methods, especially those using cyanide and dynamite. It is aggravated by the rise in temperature of the oceans. All of this helps us to see that every intervention in nature can have consequences which are not immediately evident, and that certain ways of exploiting resources prove costly in terms of

degradation which ultimately reaches the ocean bed itself.

42. Greater investment needs to be made in research aimed at understanding more fully the functioning of ecosystems and adequately analyzing the different variables associated with any significant modification of the environment. Because all creatures are connected, each must be cherished with love and respect, for all of us as living creatures are dependent on one another. Each area is responsible for the care of this family. This will require undertaking a careful inventory of the species which it hosts, with a view to developing programmes and strategies of protection with particular care for safeguarding species heading towards extinction.

## 10.3 Pope Francis meets Leonardo DiCaprio

### A long personal audience with Pope Francis

Pope Francis granted the famous actor a long personal audience, during which they discussed the climate emergency. DiCaprio said later that he was deeply impressed with the seriousness with which Pope Francis addressed the crisis.

### DiCaprio describes *Before the Flood* at its premier

At the European premier of his film<sup>2</sup> in London in October, 2016, Leonardo DiCaprio introduced it with the following words:

*Before The Flood* is the product of an incredible three-year journey that took place with my co-creator and director Fisher Stevens. We went to every corner of the globe to document the devastating impacts of climate change and questioned humanity's ability to reverse what may be the most catastrophic problem mankind has ever faced. There was a lot to take in. All that we witnessed on this journey shows us that our world's climate is incredibly interconnected and that it is at urgent breaking point. ... We wanted to create a film that gave people a sense of urgency, that made them understand what particular things are going to solve this problem. We bring up the issue of a carbon tax, for example, which I haven't seen in a lot of documentaries. Basically, sway a capitalist economy to try to invest in renewables, to bring less money and subsidies out of oil companies. These are the things that are really going to make a massive difference. ... We need to use our vote ... We cannot afford to have political leaders out there that do not believe in modern science or the scientific method or empirical truths ... We cannot afford to waste time

---

<sup>2</sup><https://wow.filmsforaction.org/watch/before-the-flood-2016/>



Figure 10.4: Pope Francis and Leonardo DiCaprio discussing DiCaprio's important film, *Before the Flood*.

having people in power that choose to believe in the 2 percent of the scientific community that is basically bought off by lobbyists and oil companies.

### **Evangelli Gaudium**

In his exhortation *Evangelli Gaudium*, Pope Francis wrote:

Just as the commandment "Thou shalt not kill" sets a clear limit in order to safeguard the value of human life, today we also have to say "thou shalt not" to an economy of exclusion and inequality. Such an economy kills... A new tyranny is thus born, invisible and often virtual, which unilaterally and relentlessly imposes its own laws and rules. To all this we can add widespread corruption and self-serving tax evasion, which has taken on worldwide dimensions. The thirst for power and possessions knows no limits.



Figure 10.5: Leonardo DiCaprio presented Pope Francis with the reproduction of a painting by Hieronymus Bosch, *The Garden of Earthly Delights*. The painting had stood beside the famous actor's bed when he was a child. It shows the world before and after the Biblical deluge.



Figure 10.6: Leonardo DiCaprio's important and eloquent film is the result of interviews with experts in all parts of the world, as well as personal observations.



Figure 10.7: **Leonardo DiCaprio discussing the climate emergency with US President Barack Obama.**

### Suggestions for further reading

1. Allen, John L. (2015). *The Francis Miracle: Inside the Transformation of the Pope and the Church*. New York: Time.
2. Borghesi, Massimo (2018) [Italian original, 2017]. *The Mind of Pope Francis: Jorge Mario Bergoglio's Intellectual Journey*. Translated by Hudock, Barry. Collegeville, Minnesota: Liturgical Press.
3. Douthat, Ross (2018). *To Change the Church: Pope Francis and the Future of Catholicism*. New York: Simon & Schuster.
4. Ivereigh, Austen (2014). *The Great Reformer: Francis and the Making of a Radical Pope*. New York: Henry Holt.
5. Reato, Ceferino (2015). *Doce noches [Twelve nights]* (in Spanish). Argentina: Sudamericana.
6. Rosales, Luis; Olivera, Daniel (2013). *Francis: A pope for our time*. United States: Umanix Books.
7. Rubin, Sergio; Ambrogetti, Francesca (2010). *El Jesuita [The jesuit]* (in Spanish) (1 ed.). Argentina: Vergara Editor.
8. Vallely, Paul (2015). *Pope Francis: Untying the Knots: The Struggle for the Soul of Catholicism (Revised and expanded ed.)*. London: Bloomsbury.
9. Willey, David (2015). *The Promise of Francis: The Man, the Pope, and the Challenge of Change*. New York: Simon & Schuster.

# Chapter 11

## JAMES HANSEN, BILL MCKIBBEN, AND AOC

### 11.1 Understanding the atmosphere of Venus

James Hansen was born in 1941 in Denison, Iowa. He was educated in physics, mathematics and astronomy at the University of Iowa in the space sciences program initiated James Van Allen. He graduated with great distinction. The studies of the atmosphere and temperature of Venus which Hansen made under Van Allen's supervision lead him to become extremely concerned about similar effects in the earth's atmosphere.

From 1962 to 1966, James Hansen participated in the National Aeronautical and Space Administration graduate traineeship and, at the same time, between 1965 and 1966, he was a visiting student at the Institute of Astrophysics at the University of Kyoto and in the Department of Astronomy at the University of Tokyo. Hansen then began work at the Goddard Institute for Space Studies in 1967. He began to work for the Goddard Institute for Space Studies in 1967. Between 1981 and 2013, he was head of the Goddard Institute of Space Studies in New York, and since 2014, he has been the director of the Program on Climate Science, Awareness and Solutions at Columbia University's Earth Institute.

Hansen continued his work with radiative transfer models, attempting to understand the Venusian atmosphere. Later he applied and refined these models to understand the Earth's atmosphere, in particular, the effects that aerosols and trace gases have on Earth's climate. Hansen's development and use of global climate models has contributed to the further understanding of the Earth's climate. In 2009 his first book, *Storms of My Grandchildren*, was published.

James Hansen has refined climate change models, focusing on the balance between aerosols and greenhouse gases. He believes that there is a danger that climate change will become much more rapid if the balance shifts towards the greenhouse gases.

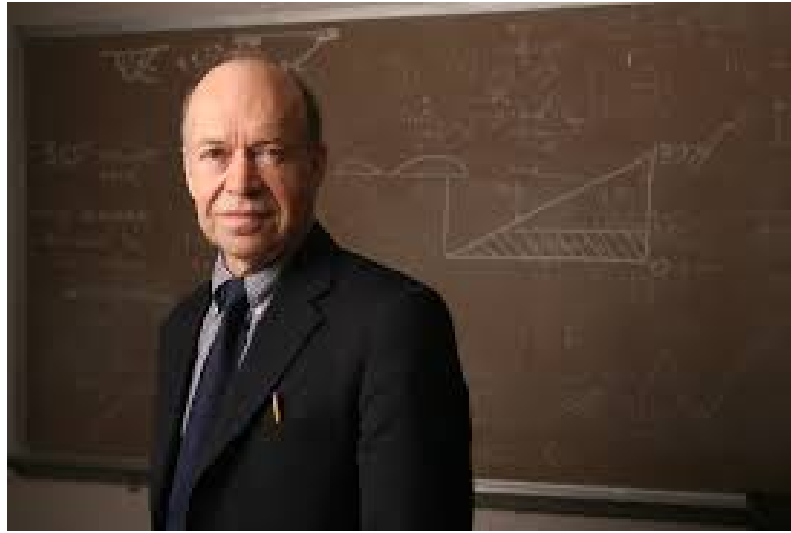


Figure 11.1: **Prof. James Hansen**

### **Hansen's Congressional testimony leads to broad public awareness of the dangers**

In 1988, Prof. Hansen was asked to testify before the US Congress on the danger of uncontrolled climate change. The testimony marked the start of broad public awareness of the seriousness of the danger, and it was reported in a front page article by the New York Times. However, Hansen believes that governmental energy policies still favor fossil fuels. Therefore he has participated in public demonstrations and he was even arrested in 2011 together with more than a thousand other activists for protesting outside the White House.

### **James Hansen's TED talk and book**

In 2012 he presented a TED Talk: *Why I Must Speak Out About Climate Change*. This talk is easily available on the Internet, and it should be required viewing for everyone who is concerned with the earth's future.

Hansen's book, *Storms of My Grandchildren: The Truth About The Coming Climate Catastrophe, and Our Last Chance To Save Humanity* was published in New York by Bloomsbury Publishing in 2009.

## **11.2 350.org**

## **11.3 The Climate Movement: What's Next?**

Here are some excerpts from a recently published article by Bill McKibben entitled *The Climate Movement: What's Next?* (Common Dreams, July 10, 2019):

I came to climate activism gradually. In 1989, when my book *The End of Nature* was published, it was the first book on global warming for a general audience. For the next fifteen, I worked mainly as a writer and speaker. That's because I was analyzing the problem incorrectly. In my estimation, we were arguing about the science of climate change. Is it real? How bad is it? How bad will it become? Being a writer, and an academic, I thought the right response seemed clear: shed light on the issue through more books, more articles, and more symposia.

At a certain point, though, I began to realize that we weren't engaged in an argument at all. The scientific debate had already been settled by about 1995, with the first major Intergovernmental Panel on Climate Change (IPCC) report. The scientific community had reached a clear consensus, yet governments did not take action to reduce greenhouse gas emissions. We were in a fight, not a discourse. Like most fights, it was about power and money. Another book or symposium was unlikely to move the needle.

On the other side of the fight stood the fossil fuel industry, with the richest - and hence most politically powerful - enterprises in human history. We weren't going to match them dollar for dollar, or even penny for dollar. History indicates that in such unequal situations, the only option is to build a movement large enough to provide a countervailing force. It has happened before, such as with the movements for women's suffrage, civil rights, and, most recently, marriage equality. Those were all hard fought, but a climate movement is harder because no one has made trillions of dollars being a bigot, but people do make trillions selling coal, oil and gas.

My expanded understanding prompted me to found 350.org, which initially consisted of myself and seven undergraduates. The biggest problem with climate change was that it seemed so large - and we seemed so small next to it. It was hard to feel hope and easy to walk away. Nevertheless, each student took one of the seven continents, and we set out to organize. All over the world, we found people who wanted to act. Our first task was to show that there was a large constituency for action. So, in our first big action in 2008, we managed to coordinate 5,100 simultaneous demonstrations in 181 countries, which CNN called the most widespread day of political action in the planet's history.

We've gone on to organize about 20,000 such rallies, in every country but North Korea. 350.org is still, I believe, the largest group that works solely on climate change, with a not-so-large staff of 120 spread around the world. On the ground, we have found a huge if diffuse movement, made up mostly of indigenous and other frontline communities bearing the brunt of the fossil fuel

industry. Much of our work is thus focused on coordinating the multitude of worthy efforts already underway.

Given the urgency of the climate crisis, we also quickly saw the need to move beyond education to confrontation - hence, in the US, the birth of the continent-wide Keystone pipeline fight. There was already a movement in place in the tar sands of Alberta and on the prairies of Nebraska through which the proposed pipeline would pass. But we nationalized the movement, with demonstrations in DC and pressure on President Barack Obama. So far, the pipeline remains unbuilt. Every project like this around the world (e.g., fracking wells, coal ports, LNG terminals) is a target for opposition. We may not always win, but we always make life harder for the industry.

On another front, we realized that, to be successful, we needed to systematically confront the instruments used to sustain the dominance of fossil fuels. Thus, we launched the divestment movement in 2012 with the goal of reducing the financing for and, more importantly, social acceptance of the extraction of fossil fuels. It has grown much faster than we expected, and it is now the largest anti-corporate campaign of its kind in history, with commitments from endowments and other portfolios worth about \$8 trillion. Goldman Sachs said recently that the campaign is the main contributor to driving the prices of coal shares down sixty percent, and Shell said it had become a “material risk” to its business...

We are not going to stop climate change - that is no longer on the menu. Standing on the Greenland ice shelf last summer and seeing it melting was sobering. We’re now playing for whether warming is going to reach 2, 3 or 4 °C, with the latter appearing increasingly likely. That range of temperature rise means we still can decide to sustain a livable civilization. But the window for survival is closing fast.

We must use this moment as crucial leverage to push the planet in a new direction. If we succeed, then we have risen to the greatest crisis humans have ever faced and shown that the big brain was a useful evolutionary adaptation.

## 11.4 Bill McKibben

Bill McKibben’s biography (from the 350.org website)

Bill McKibben is an author and environmentalist who in 2014 was awarded the Right Livelihood Prize, sometimes called the “alternative Nobel”. His 1989

book *The End of Nature* is regarded as the first book for a general audience about climate change, and has appeared in 24 languages; he's gone on to write a dozen more books. He is a founder of 350.org, the first planet-wide, grassroots climate change movement, which has organized twenty thousand rallies around the world in every country save North Korea, spearheaded the resistance to the Keystone Pipeline, and launched the fast-growing fossil fuel divestment movement.

The Schumann Distinguished Scholar in Environmental Studies at Middlebury College and a fellow of the American Academy of Arts and Sciences, he was the 2013 winner of the Gandhi Prize and the Thomas Merton Prize, and holds honorary degrees from 18 colleges and universities. *Foreign Policy* named him to their inaugural list of the world's 100 most important global thinkers, and the *Boston Globe* said he was "probably America's most important environmentalist."

A former staff writer for the *New Yorker*, he writes frequently for a wide variety of publications around the world, including the *New York Review of Books*, *National Geographic*, and *Rolling Stone*. He lives in the mountains above Lake Champlain with his wife, the writer Sue Halpern, where he spends as much time as possible outdoors. In 2014, biologists honored him by naming a new species of woodland gnat - *Megophthalmidia mckibbeni* - in his honor.

## This climate strike is part of the disruption that we need

Here are excerpts from a September 3 2019 article by Bill McKibben, published in *Yes Magazine*;

Business as usual is what's doing us in.

We live on a planet that finds itself rather suddenly in the midst of an enormous physical crisis. Because we burn so much coal and gas and oil, the atmosphere of our world is changing rapidly, and that atmospheric change is producing record heat. July was the hottest month we've ever recorded. Scientists predict with confidence that we stand on the edge of the sixth great extinction event of the last billion years. People are dying in large numbers and being left homeless; millions are already on the move because they have no choice.

And yet we continue on with our usual patterns. We get up each morning and do pretty much what we did the day before. It's not like the last time we were in an existential crisis, when Americans signed up for the Army and crossed the Atlantic to face down fascism and when the people back home signed up for new jobs and changed their daily lives.

That's why it's such good news that the climate movement has a new tactic. Pioneered last August by Greta Thunberg of Sweden, it involves disrupting business as usual. It began, of course, in schools: Within months, millions

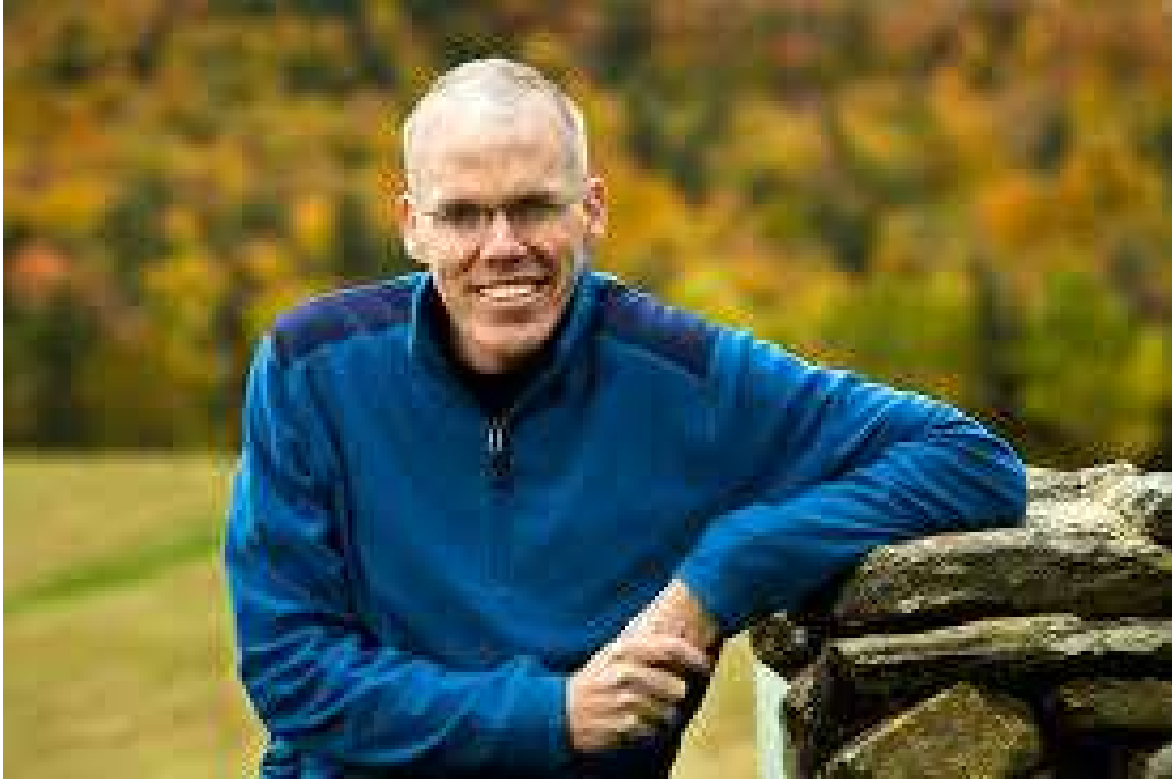


Figure 11.2: The American author, journalist and environmental activist Bill McKibben (born in 1960) is the founder and leader of 350.org, an important organization that campaigns world-wide for the immediate reduction of CO<sub>2</sub> emissions. Wikipedia writes of him: “In 2009, he led 350.org’s organization of 5,200 simultaneous demonstrations in 181 countries. In 2010, McKibben and 350.org conceived the 10/10/10 Global Work Party, which convened more than 7,000 events in 188 countries.” After graduating from Harvard in 1982, McKibben worked for five years as a writer for the New Yorker Magazine, after which he produced numerous books on the dangers of climate change. 350.org takes its name from James Hansen’s statement that “If humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted, paleoclimate evidence and ongoing climate change suggest that CO<sub>2</sub> will need to be reduced from its current 385 ppm to at most 350 ppm, but likely less than that.” (Today the atmospheric CO<sub>2</sub> concentration has exceeded 400 ppm!). In 2014, Bill McKibben and 350.org shared the Right Livelihood Award, which is often called the “Alternative Nobel Prize”.

of young people around the world were striking for days at a time from their classes. Their logic was impeccable: If the institutions of our planet can't be bothered to prepare for a world we can live in, why must we spend years preparing ourselves? If you break the social contract, why are we bound by it?

And now those young people have asked the rest of us to join in. After the last great school strike in May, they asked adults to take part next time. The date is Sept. 20, and the location is absolutely everywhere. Big trade unions in South Africa and Germany are telling workers to take the day off. Ben and Jerry's is closing down its headquarters (stock up in advance), and if you want to buy Lush cosmetics, you're going to be out of luck. The largest rally will likely be in New York City, where the U.N. General Assembly begins debating climate change that week - but there will be gatherings in every state and every country. It will almost certainly be the biggest day of climate action in the planet's history. (If you want to be a part - and you do want to be a part - go to [globalclimatestrike.net](http://globalclimatestrike.net).)

## 11.5 Alexandria Ocasio-Cortez

Alexandria Ocasio-Cortez (born in 1989) won a stunning victory in the Democratic Party primary election of June 26, 2018. Although outspent by a factor of 18 to 1 by her opponent (Democratic Caucus Chair, Joseph Crowley), she won the primary by 57% to 42%. Her campaign contributions came from small individual donors, while his came in large blocks, from corporations. Ocasio-Cortez calls for the United States to transition by 2035 to an electrical grid running on 100% renewable-energy production and end the use of fossil fuels. She calls healthcare "a human right", and says: "Almost every other developed nation in the world has universal healthcare. It's time the United States catch up to the rest of the world in ensuring all people have real healthcare coverage that doesn't break the bank".

The Guardian called her victory "one of the biggest upsets in recent American political history", and Senator Bernie Sanders commented "She took on the entire local Democratic establishment in her district and won a very strong victory. She demonstrated once again what progressive grassroots politics can do". The lesson that the US Democratic Party must learn from this is that in order to overthrow Donald Trump's openly racist and climate-change-denying Republican Party, they must free themselves from the domination of corporate oligarchs, and instead stand for honest government and progressive values.

Even before taking her place in the US House of Representatives, with its newly-won Democratic majority, Alexandria Ocasio-Cortez became the leader of a campaign for a Green New Deal. This program takes its inspiration from the massive Federal government program by which Franklin Delano Roosevelt ended the depression of the 1930's. FDR's New Deal built dams, planted forests, and in general to create much needed infrastructure, while at the same time addressing the problem of unemployment by providing jobs. Wikipedia describes FDR's New Deal as follows:

"The New Deal was a series of programs, public work projects, financial reforms and

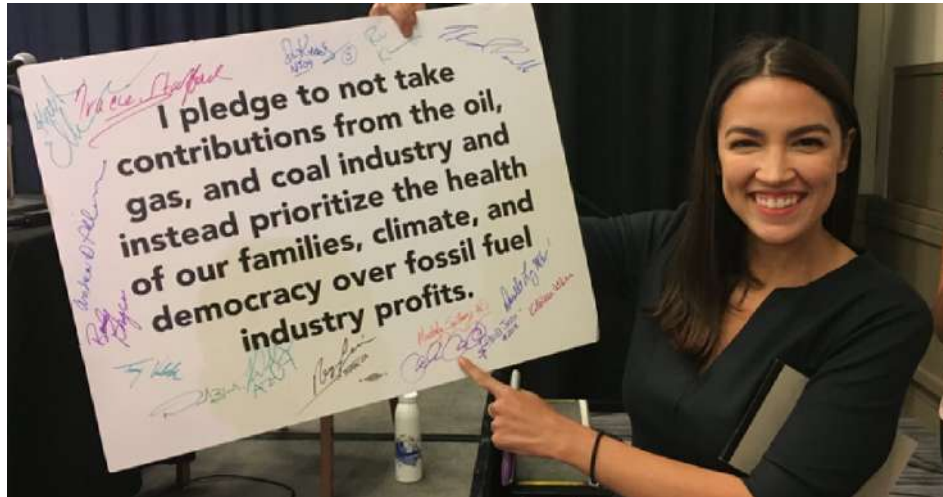


Figure 11.3: 28-year-old Alexandria Ocasio-Cortez (born in 1989) won a stunning victory in the Democratic Party primary election of June 26, 2018. Although outspent by a factor of 18 to 1 by her opponent (Democratic Caucus Chair, Joseph Crowley), she won the primary by 57% to 42%. Her campaign contributions came from small individual donors, while his came in large blocks, from corporations. Ocasio-Cortez calls for the United States to transition by 2035 to an electrical grid running on 100% renewable-energy production and end the use of fossil fuels. She calls healthcare “a human right”, and says: “Almost every other developed nation in the world has universal healthcare. It’s time the United States catch up to the rest of the world in ensuring all people have real healthcare coverage that doesn’t break the bank”. The Guardian called her victory “one of the biggest upsets in recent American political history”, and Senator Bernie Sanders commented “She took on the entire local Democratic establishment in her district and won a very strong victory. She demonstrated once again what progressive grassroots politics can do”. The lesson that the US Democratic Party must learn from this is that in order to overthrow Donald Trump’s openly racist Republican Party in the 2020 elections, they must free themselves from the domination of corporate oligarchs, and instead stand for honest government and progressive values.

regulations enacted by President Franklin D. Roosevelt in the United States between 1933 and 1936. It responded to needs for relief, reform and recovery from the Great Depression. Major federal programs included the Civilian Conservation Corps (CCC), the Civil Works Administration (CWA), the Farm Security Administration (FSA), the National Industrial Recovery Act of 1933 (NIRA) and the Social Security Administration (SSA). They provided support for farmers, the unemployed, youth and the elderly. The New Deal included new constraints and safeguards on the banking industry and efforts to re-inflate the economy after prices had fallen sharply. New Deal programs included both laws passed by Congress as well as presidential executive orders during the first term of the presidency of Franklin D. Roosevelt. The programs focused on what historians refer to as the ‘3 Rs’: relief for the unemployed and poor, recovery of the economy back to normal levels and reform of the financial system to prevent a repeat depression.”

Alexandria Ocasio-Cortez believes that the climate emergency that the world now faces is a much more severe emergency than the great depression. Indeed, if quick action is not taken immediately, the long-term effects of catastrophic climate change pose existential threats to human civilization and the biosphere. Therefore she advocates a massive governmental program to create renewable energy infrastructure. Such a program, like FDR’s New Deal, would simultaneously solve the problem of unemployment. Money for the program could be taken from the Pentagon’s obscenely bloated budget. Ocasio-Cortez has also proposed a 70% income tax for the ultra-wealthy.

According to a January 24 2019 article by Robert R. Raymond, “When polled, 92 percent of registered Democratic voters say they support the Green New Deal. But perhaps more importantly, a full 81 percent of all registered voters support it - a number that includes both Republicans and Democrats.”<sup>1</sup>

House Speaker Nancy Pelosi is facing criticism from some climate activists for failing to back a Green New Deal. Last week Pelosi announced the formation of a new Select Committee on the Climate Crisis, headed by long-standing Florida Congressmember Kathy Castor. But the committee is far weaker than what backers of a Green New Deal had envisioned. The committee will not have subpoena power or the power to draft legislation. We speak with Varshini Prakash, founder of the Sunrise Movement, a youth-led climate group that has occupied and lobbied at congressional offices, risking arrest to demand adoption of the Green New Deal and bold climate leadership.

---

<sup>1</sup><https://truthout.org/articles/the-democratic-party-is-further-to-the-right-than-most-voters/>



Figure 11.4: The Green New Deal advocated by Ocasio-Cortez proposes to use jobs creating renewable energy infrastructure to ensure full employment, in a manner analogous to Roosevelt's New Deal.



Figure 11.5: Members of the Sunrise movement in the office of House Majority Leader Nancy Pelosi, protesting against her lack of support for the Green New Deal.



## 11.6 Realities of climate change

### Predictions of drought in the Stern Review

According to a report presented to the Oxford Institute of Economic Policy by Sir Nicholas Stern on 31 January, 2006, areas likely to lose up to 30% of their rainfall by the 2050's because of climate change include much of the United States, Brazil, the Mediterranean region, Eastern Russia and Belarus, the Middle East, Southern Africa and Southern Australia. Meanwhile rainfall is predicted to increase up to 30% in Central Africa, Pakistan, India, Bangladesh, Siberia, and much of China.

Stern and his team point out that “We can... expect to see changes in the Indian monsoon, which could have a huge impact on the lives of hundreds of millions of people in India, Pakistan and Bangladesh. Most climate models suggest that the monsoon will change, although there is still uncertainty about exactly how. Nevertheless, small changes in the monsoon could have a huge impact. Today, a fluctuation of just 10% in either direction from average monsoon rainfall is known to cause either severe flooding or drought. A weak summer monsoon, for example, can lead to poor harvests and food shortages among the rural population - two-thirds of India's almost 1.1 billion people. Heavier-than-usual monsoon downpours can also have devastating consequences...”

In some regions, melting of glaciers can be serious from the standpoint of dry-season water supplies. For example, melts from glaciers in the Hindu Kush and the Himalayas now supply much of Asia, including China and India, with a dry-season water supply. Complete melting of these glacial systems would cause an exaggerated runoff for a few decades, after which there would be a drying out of some of the most densely populated regions of the world.

## Ocean current changes and failure of monsoons

It is expected that climate change will affect ocean currents, and hence also affect monsoon rainfall. We are already experiencing a diversion of the Gulf Stream due to southward currents of cold water from melting ice in the Arctic. This has caused what is known as the *North Atlantic Anomaly*. While most regions of the world are experiencing rising temperatures, the North Atlantic and several northern European countries are exceptions to this rule, and have cooled. Complete failure of the Gulf Stream would lead to much colder temperatures in Europe.

Changes in ocean currents have already lead to the failure of the West African Monsoon, and this has already produced severe food insecurity in West Africa.

In the future, climate-changed ocean currents may lead to failures of monsoons in South-east Asia, and thus damage the food supply of almost two billion people.

## Falling water tables around the world

Under many desert areas of the world are deeply buried water tables formed during glacial periods when the climate of these regions was wetter. These regions include the Middle East and large parts of Africa. Water can be withdrawn from such ancient reservoirs by deep wells and pumping, but only for a limited amount of time.

In oil-rich Saudi Arabia, petroenergy is used to drill wells for ancient water and to bring it to the surface. Much of this water is used to irrigate wheat fields, and this is done to such an extent that Saudi Arabia exports wheat. The country is, in effect, exporting its ancient heritage of water, a policy that it may, in time, regret. A similarly short-sighted project is Muammar Qaddafi's enormous pipeline, which will bring water from ancient sub-desert reservoirs to coastal cities.

In the United States, the great Ogallala aquifer is being overdrawn. This aquifer is an enormous stratum of water-saturated sand and gravel under-lying parts of northern Texas, Oklahoma, New Mexico, Kansas, Colorado, Nebraska, Wyoming and South Dakota. The average thickness of the aquifer is about 70 meters. The rate of water withdrawal from the aquifer exceeds the rate of recharge by a factor of eight.

Thus we can see that in many regions, the earth's present population is living on its inheritance of water, rather than its income. This fact, coupled with rapidly increasing populations and climate change, may contribute to a very serious food crisis partway through the 21st century.

## Glacial melting and summer water supplies

The summer water supplies of both China and India are threatened by the melting of glaciers. The Gangotri glacier, which is the principle glacier feeding India's great Ganges River, is reported to be melting at an accelerating rate, and it could disappear within a few decades. If this happens, the Ganges could become seasonal, flowing only during the monsoon season. Chinese agriculture is also threatened by disappearing Himalayan

glaciers, in this case those on the Tibet-Quinghai Plateau. The respected Chinese glaciologist Yao Tandong estimates that the glaciers feeding the Yangtze and Yellow Rivers are disappearing at the rate of 7% per year.<sup>2</sup>

## Loss of Arctic sea ice

The melting of Arctic sea ice is taking place far more rapidly than was predicted by IPCC reports. David Wasdell, Director of the Apollo-Gaia Project, points out that the observed melting has been so rapid that within less than five years, the Arctic may be free of sea ice at the end of each summer. It will, of course continue to re-freeze during the winters, but the thickness and extent of the winter ice will diminish.

For January 2016, the satellite based data showed the lowest overall Arctic sea ice extent of any January since records begun in 1979. Bob Henson from *Wundergrund* commented: “Hand in hand with the skimpy ice cover, temperatures across the Arctic have been extraordinarily warm for midwinter. Just before New Year’s, a slug of mild air pushed temperatures above freezing to within 200 miles of the North Pole. That warm pulse quickly dissipated, but it was followed by a series of intense North Atlantic cyclones that sent very mild air poleward, in tandem with a strongly negative Arctic Oscillation during the first three weeks of the month.”

During some periods, Arctic temperatures have been 50°C above normal for the time of year. Equally alarming is the fact that plumes of methane several km<sup>2</sup> in area have been observed bubbling up from the sea floor in the shallow ice-free seas north of Russia.<sup>3</sup>

## Temperature and CO<sub>2</sub> in ice cores

Ice cores from the Greenland and Antarctic ice sheets and from glaciers have yielded valuable data on climate changes as far back as 800,000 years in the past. The ice cores show that there is a close correlation between global temperatures and the CO<sub>2</sub> content of the atmosphere. The cores also show that climatic changes can take place with great rapidity.

An article by Richard B. Alley in the Proceedings of the National Academy of Science (US) <sup>4</sup> Here is an excerpt from the article:

“Ice-core records show that climate changes in the past have been large, rapid, and synchronous over broad areas extending into low latitudes, with less variability over historical times. These ice-core records come from high mountain glaciers and the polar regions, including small ice caps and the large ice sheets of Greenland and Antarctica.

“As the world slid into and out of the last ice age, the general cooling and warming trends were punctuated by abrupt changes. Climate shifts up to half as large as the entire

<sup>2</sup><http://www.commondreams.org/news/2015/08/04/global-glaciers-melting-three-times-rate-20th-century>

<sup>3</sup>N. Shakhova et al., *Methane release on the Arctic East Siberian shelf*, Geophysical Research Abstracts, Vol.9, 01071, 2007

<sup>4</sup>Proc Natl Acad Sci U S A. 2000 Feb 15; 97(4): 1331-1334. PMID: PMC34297

difference between ice age and modern conditions occurred over hemispheric or broader regions in mere years to decades. Such abrupt changes have been absent during the few key millennia when agriculture and industry have arisen. The speed, size, and extent of these abrupt changes required a reappraisal of climate stability. Records of these changes are especially clear in high-resolution ice cores. Ice cores can preserve histories of local climate (snowfall, temperature), regional (wind-blown dust, sea salt, etc.), and broader (trace gases in the air) conditions, on a common time scale, demonstrating synchrony of climate changes over broad regions.”

### Short-term sea level rise

The *National Geographic* recently published an article by Laura Parker entitled “Sea Level Rise Will Flood Hundreds of Cities in the Near Future+.”<sup>5</sup> Here are a few excerpts from the article:

“Sea level rise caused by global warming is usually cast as a doomsday scenario that will play out so far into the future, it’s easy to ignore. Just ask anyone in South Florida, where new construction proceeds apace. Yet already, more than 90 coastal communities in the United States are battling chronic flooding, meaning the kind of flooding that’s so unmanageable it prompts people to move away.

“That number is expected to roughly double to more than 170 communities in less than 20 years.

“Those new statistics, compiled in the first comprehensive mapping of the entire coastline of the Lower 48 states, paint a troubling picture, especially for the East and Gulf coasts, which are home to some of the nation’s most populated areas.

“By the end of the century, chronic flooding will be occurring from Maine to Texas and along parts of the West Coast. It will affect as many as 670 coastal communities, including Cambridge, Massachusetts; Oakland, California; Miami and St. Petersburg, Florida; and four of the five boroughs of New York City. The magnitude of the coming calamity is so great, the ripple effects will reach far into the interior.”

Just as an iceberg the size of Delaware broke away from an ice shelf in Antarctica Wednesday, July 12, 2017, scientists released findings that up to 668 U.S. communities could face chronic flooding from rising sea levels by the end of the century.

The Union of Concerned Scientists recently published a report entitled “When Rising Seas Hit Home: Hard Choices Ahead for Hundreds of US Coastal Communities”<sup>6</sup> The report states that “Chronic inundation will dramatically alter the landscape and the livability rise of just three feet would submerge the Maldives and make them uninhabitable of many coastal communities.” rise of just three feet would submerge the Maldives and make them uninhabitable

---

<sup>5</sup><http://news.nationalgeographic.com/2017/07/sea-level-rise-flood-global-warming-science/>

<sup>6</sup><http://www.ucsusa.org/sites/default/files/attach/2017/07/when-rising-seas-hit-home-full-report.pdf>

## **Island nations threatened by rising oceans**

The US National Academy of Sciences predictions from 2009 suggest that by 2100, sea level could increase by anywhere from 16 inches to 56 inches, depending how the Earth responds to changing climate.

The Maldives, consisting of over 1,100 islands to the west of India, is the world's lowest-lying nation. On average the islands are only 1.3 meters above sea level. The 325,000 (plus 100,000 expatriate workers who are not counted in the census) residents of the islands are threatened by rising sea levels. A rise of just three feet would submerge the Maldives and make them uninhabitable. Many island nations in the Pacific are also severely threatened by sea level rise.

## **Displacement of populations in Southeast Asia**

A World Bank press release has stated that "Bangladesh will be among the most affected countries in South Asia by an expected 2°C rise in the world's average temperatures in the next decades, with rising sea levels and more extreme heat and more intense cyclones threatening food production, livelihoods, and infrastructure as well as slowing the reduction on poverty, according to a new scientific report released today by the World Bank Group.

" 'Bangladesh faces particularly severe challenges with climate change threatening its impressive progress in overcoming poverty,' said Johannes Zutt, World Bank Country Director for Bangladesh and Nepal. 'Bangladesh has demonstrated itself as a leader in moving the climate change agenda forward'"

"In Bangladesh, 40% of productive land is projected to be lost in the southern region of Bangladesh for a 65cm sea level rise by the 2080s. About 20 million people in the coastal areas of Bangladesh are already affected by salinity in drinking water. Rising sea levels and more intense cyclones and storm surges could intensify the contamination of groundwater and surface water causing more diarrhea outbreak."

Important rice-growing river delta regions of Viet Nam will also be lost during the present century.

## **Effects on the Netherlands, Danish islands, and Venice**

Although the Netherlands, the Danish islands and Venice have had many years of experience in coping with floods due to high sea levels and storm surges, these European areas may have difficulties during the present century.

Greenland's icecap is melting much faster than was predicted by the IPCC, and sea level rise may exceed 100 cm. before 2100. Hurricanes are also becoming more severe, as has already been shown by Katrina and Sandy. Future hurricanes hitting Europe's Atlantic coasts will produce dangerous storm surges. In Venice, the danger from hurricanes is less severe, but Venice already experiences severe flooding and the rise of sea levels during the present century may endanger the priceless cultural monuments of the famous ancient city.

## Long-term sea level rise

A 2012 article by Jevrejeva, S., Moore, J. C. and Grinsted, A. in the in the Journal of Global and Planetary Change<sup>7</sup> deals with sea level rise until 2500. Of course, the long-term future runs over hundreds of millennia, but nevertheless, the article, entitled “Sea level projections to AD2500 with a new generation of climate change scenarios” is of interest.

The article states that “Sea level rise over the coming centuries is perhaps the most damaging side of rising temperature. The economic costs and social consequences of coastal flooding and forced migration will probably be one of the dominant impacts of global warming. To date, however, few studies on infrastructure and socio-economic planning include provision for multi-century and multi-meter rises in mean sea level...

“We estimate sea level rise of 0.57 - 1.10 m by 2100 with four new RCP scenarios. Sea level will continue to rise for several centuries reaching 1.84 - 5.49 m by 2500. Due to long response time most rise is expected after stabilization of forcing. 200-400 years will require dropping the rate to the 1.8 mm/yr- 20th century average.”

According to an article published by the Potsdam Institute for Climate Impact Research<sup>8</sup> “The Greenland ice sheet is likely to be more vulnerable to global warming than previously thought. The temperature threshold for melting the ice sheet completely is in the range of 0.8 to 3.2 degrees Celsius global warming, with a best estimate of 1.6 degrees above pre-industrial levels, shows a new study by scientists from the Potsdam Institute for Climate Impact Research (PIK) and the Universidad Complutense de Madrid. Today, already 0.8 degrees global warming has been observed. Substantial melting of land ice could contribute to long-term sea-level rise of several meters and therefore it potentially affects the lives of many millions of people.

“The time it takes before most of the ice in Greenland is lost strongly depends on the level of warming. ‘The more we exceed the threshold, the faster it melts,’ says Alexander Robinson, lead-author of the study now published in Nature Climate Change. In a business-as-usual scenario of greenhouse-gas emissions, in the long run humanity might be aiming at 8 degrees Celsius of global warming. This would result in one fifth of the ice sheet melting within 500 years and a complete loss in 2000 years, according to the study. ‘This is not what one would call a rapid collapse,’ says Robinson. ‘However, compared to what has happened in our planet’s history, it is fast. And we might already be approaching the critical threshold.’

“In contrast, if global warming would be limited to 2 degrees Celsius, complete melting would happen on a timescale of 50.000 years. Still, even within this temperature range often considered a global guardrail, the Greenland ice sheet is not secure. Previous research suggested a threshold in global temperature increase for melting the Greenland ice sheet of a best estimate of 3.1 degrees, with a range of 1.9 to 5.1 degrees. The new study’s best estimate indicates about half as much.

“Our study shows that under certain conditions the melting of the Greenland ice sheet

---

<sup>7</sup>Volumes 80-81, January 2012, Pages 14.20

<sup>8</sup><https://www.pik-potsdam.de/news/press-releases/archive/2012/gronlands-eismassen-konnten-komplett-schmelzen-bei-1-6-grad-globaler-erwarmung>

becomes irreversible. This supports the notion that the ice sheet is a tipping element in the Earth system,' says team-leader Andrey Ganopolski of PIK. 'If the global temperature significantly overshoots the threshold for a long time, the ice will continue melting and not re-grow - even if the climate would, after many thousand years, return to its preindustrial state- This is related to feedbacks between the climate and the ice sheet: The ice sheet is over 3000 meters thick and thus elevated into cooler altitudes. When it melts its surface comes down to lower altitudes with higher temperatures, which accelerates the melting. Also, the ice reflects a large part of solar radiation back into 'Our study shows that under certain conditions the melting of the Greenland ice sheet becomes irreversible. This supports the notion that the ice sheet is a tipping element in the Earth system,' says team-leader Andrey Ganopolski of PIK.'If the global temperature significantly overshoots the threshold for a long time, the ice will continue melting and not re-grow - even if the climate would, after many thousand years, return to its preindustrial state.' This is related to feedbacks between the climate and the ice sheet: The ice sheet is over 3000 meters thick and thus elevated into cooler altitudes. When it melts its surface comes down to lower altitudes with higher temperatures, which accelerates the melting. Also, the ice reflects a large part of solar radiation back into space. When the area covered by ice decreases, more radiation is absorbed and this adds to regional warming.space. When the area covered by ice decreases, more radiation is absorbed and this adds to regional warming."

## **Global warming and atmospheric water vapor**

A feedback loop is a self-re-enforcing trend. One of the main positive feedback loops in global warming is the tendency of warming to increase the atmospheric saturation pressure for water vapor, and hence amount of water vapor in the atmosphere, which in turn leads to further warming, since water vapor is a greenhouse gas.

Wikipedia's article on greenhouse gases states that, "Water vapor accounts for the largest percentage of the greenhouse effect, between 36% and 66% for clear sky conditions and between 66% and 85% when including clouds."

## **The albedo effect**

Albedo is defined to be the fraction of solar energy (shortwave radiation) reflected from the Earth back into space. It is a measure of the reflectivity of the earth's surface. Ice, especially with snow on top of it, has a high albedo: most sunlight hitting the surface bounces back towards space.

## **Feedback from loss of sea ice**

Especially in the Arctic and Antarctic regions, there exists a dangerous feedback loop involving the albedo of ice and snow. Arctic sea ice is rapidly disappearing. It is predicted that during the summers, the ice covering arctic seas may disappear entirely during the

summers. As a consequence, incoming sunlight will encounter dark light-absorbing water surfaces rather than light-reflecting ice and snow.

This effect is self-re-enforcing. In other words, it is a feedback loop. The rising temperatures caused by the absorption of more solar radiation cause the melting of more ice, and hence even more absorption of radiation rather than reflection, still higher temperatures, more melting, and so on.

The feedback loop is further strengthened by the fact that water vapor acts like a greenhouse gas. As polar oceans become exposed, more water vapor enters the atmosphere, where it contributes to the greenhouse effect and rising temperatures.

## Darkened snow on Greenland's icecap

Greenland's icecap is melting, and as it melts, the surface becomes darker and less reflective because particles of soot previously trapped in the snow and ice become exposed. This darkened surface absorbs an increased amount of solar radiation, and the result is accelerated melting.

## The methane hydrate feedback loop

If we look at the distant future, by far the most dangerous feedback loop involves methane hydrates or methane clathrates. When organic matter is carried into the oceans by rivers, it decays to form methane. The methane then combines with water to form hydrate crystals, which are stable at the temperatures and pressures which currently exist on ocean floors. However, if the temperature rises, the crystals become unstable, and methane gas bubbles up to the surface. Methane is a greenhouse gas which is 70 times as potent as CO<sub>2</sub>.

The worrying thing about the methane hydrate deposits on ocean floors is the enormous amount of carbon involved: roughly 10,000 gigatons. To put this huge amount into perspective, we can remember that the total amount of carbon in world CO<sub>2</sub> emissions since 1751 has only been 337 gigatons.

A runaway, exponentially increasing, feedback loop involving methane hydrates could lead to one of the great geological extinction events that have periodically wiped out most of the animals and plants then living. This must be avoided at all costs.

## A feedback loop from warming of soils

On October 6, 2017, the journal *Science* published an article entitled *Long-term pattern and magnitude of soil carbon feedback to the climate system in a warming world*<sup>9</sup>. The lead author, Jerry Melillo, is an ecologist working at the Marine Biological Laboratory, Woods Hole Massachusetts. In an interview with *Newsweek*, he said: "This self-reinforcing feedback is potentially a global phenomenon with soils, and once it starts it may be very

---

<sup>9</sup>J.M. Melillo et al., *Long-term pattern and magnitude of soil carbon feedback to the climate system in a warming world*, *Science*, Vol. 358, pp. 101-105, (2017).

difficult to turn off. It's that part of the problem that I think is sobering... We think that one of the things that may be happening is both a reorganization of the microbial community structure and its functional capacity,"

The study reported on three decades of observations of heated sections of a forest owned by Harvard University. The heated sections were 5°C warmer than control sections.

## Drying of forests and forest fires

According to a recent article in *Nature*<sup>10</sup>, "Across the American west, the area burned each year has increased significantly over the past several decades, a trend that scientists attribute both to warming and drying and to a century of wildfire suppression and other human activities. Allen suggests that the intertwined forces of fire and climate change will take ecosystems into new territory, not only in the American west but also elsewhere around the world. In the Jemez, for example, it could transform much of the ponderosa pine (*Pinus ponderosa*) forest into shrub land. 'We're losing forests as we've known them for a very long time,' says Allen. 'We're on a different trajectory, and we're not yet sure where we're going.'

"All around the American west, scientists are seeing signs that fire and climate change are combining to create a 'new normal'. Ten years after Colorado's largest recorded fire burned 56,000 hectares southwest of Denver, the forest still has not rebounded in a 20,000-hectare patch in the middle, which was devastated by an intense crown fire. Only a few thousand hectares, which the US Forest Service replanted, look anything like the ponderosa-pine stands that previously dominated the landscape."

## Tipping points and feedback loops

A tipping point is usually defined as the threshold for an abrupt and irreversible change<sup>11</sup>. To illustrate this idea, we can think of a book lying on a table. If we gradually push the book towards the edge of the table, we will finally reach a point after which more than half of the weight of the book will not be supported by the table. When this "tipping point" is passed the situation will suddenly become unstable, and the book will fall to the floor. Analogously, as the earth's climate gradually changes, we may reach tipping points. If we pass these points, sudden instabilities and abrupt climatic changes will occur.

Greenland ice cores supply a record of temperatures in the past, and through geological evidence we have evidence of sea levels in past epochs. These historical records show that abrupt climatic changes have occurred in the past.

Timothy Michael Lenton, FRS, Professor of Climate Change and Earth System Science at the University of Exeter, lists the following examples of climatic tipping points:

- Boreal forest dieback

<sup>10</sup><http://www.nature.com/news/forest-fires-burn-out-1.11424>

<sup>11</sup>Other definitions of tipping points are possible. A few authors define these as points beyond which change is inevitable, emphasizing that while inevitable, the change may be slow.



Figure 11.6: Indigenous people marching in defense of Mother Earth.

- Amazon rainforest dieback
- Loss of Arctic and Antarctic sea ice (Polar ice packs) and melting of Greenland and Antarctic ice sheets
- Disruption to Indian and West African monsoon
- Formation of Atlantic deep water near the Arctic ocean, which is a component process of the thermohaline circulation.
- Loss of permafrost, leading to potential Arctic methane release and clathrate gun effect

It can be seen from this list that climate tipping points are associated with feedback loops. For example, the boreal forest dieback and the Amazon rainforest dieback tipping points are associated with the feedback loop involving the drying of forests and forest fires, while the tipping point involving loss of Arctic and Antarctic sea ice is associated with the Albedo effect feedback loop. The tipping point involving loss of permafrost is associated with the methane hydrate feedback loop.

Once a positive feedback loop starts to operate in earnest, change may be abrupt.



Figure 11.7: Marchers in New York advocacy action to prevent catastrophic climate change, September 21, 2014. The march supported the United Nations Climate Change Summit. Worldwide, 600,000 people marched, making this event the largest public climate change action in history.

## The UN Climate Change Summit, September, 2014

Delegates at the United Nations Climate Summit were shown images of the inspiring and heartfelt People's Climate March, which took place on Sunday, September 21st. The organizers of the march had expected 100,000 participants. In fact, more than 400,000 people came, and the march was unique in its artistic brilliance and its ethnic diversity. It was one of 2,600 events in 170 nations. The slogan of the march in New York was "To change everything, we need everyone", and in fact everyone came!

More than 400,000 people participated in New York's People's Climate March, and the march was unique in its artistic brilliance and its ethnic diversity. It was one of 2,600 events in 170 nations.

## The Paris Climate Conference, 2015

WE NEED SYSTEM CHANGE, NOT CLIMATE CHANGE! Civil society, excluded from the COP21 conference by the French government, carried banners with this slogan on the streets of Paris. They did so in defiance of tear-gas-using black-clad police. System change has been the motto for climate marches throughout the world. Our entire system is leading us towards disaster, and this includes both economic and governmental establishments. To save human civilization, the biosphere and the future, the people of the world must take matters into their own hands and change the system.<sup>12</sup>

Our present situation is this: The future looks extremely dark because of human folly, especially the long-term future. The greatest threats are catastrophic climate change and thermonuclear war, but a large-scale global famine also has to be considered. All these threats are linked.

Inaction is not an option. We have to act with courage and dedication, even if the odds are against success, because the stakes are so high. The mass media could mobilize us to action, but they have failed in their duty. Our educational system could also wake us up and make us act, but it too has failed us. The battle to save the earth from human greed and folly has to be fought through non-violent action on the streets and in the alternative media.

We need a new economic system, a new society, a new social contract, a new way of life. Here are the great tasks that history has given to our generation: We must achieve a steady-state economic system. We must restore democracy. We must decrease economic inequality. We must break the power of corporate greed. We must leave fossil fuels in the

---

<sup>12</sup><http://www.commondreams.org/views/2015/12/11/we-are-out-time-we-need-leap>  
<http://www.thenation.com/article/naomi-klein-sane-climate-policies-are-being-undermined-by-corporate-friendly-trade-deals/>  
<http://www.commondreams.org/news/2015/12/08/liberte-not-just-word-klein-corbyn-call-mass-protest-cop21>  
<http://www.truth-out.org/news/item/33982-the-cops-of-cop21-arrests-at-the-paris-climate-talks>  
<http://www.truth-out.org/news/item/33961-climate-change-justice>  
<http://www.countercurrents.org/avery280914.htm>

ground. We must stabilize and ultimately reduce the global population. We must eliminate the institution of war. And finally, we must develop a more mature ethical system to match our new technology.<sup>13</sup>

What are the links between the problems facing us? There is a link between climate change and war. We need to leave fossil fuels in the ground if we are to avoid catastrophic climate change. But nevertheless, the struggle for the world's last remaining oil and gas resources motivated the invasion of Iraq, and it now motivates the war in Syria. Both of these brutal wars have caused an almost indescribable amount of suffering.

ISIS runs on oil, and the unconditional support of Saudi Arabia by the West is due to greed for oil. Furthermore, military establishments are among the largest users of oil, and the largest greenhouse gas emitters. Finally, the nearly 2 trillion dollars that the world now spends on armaments and war could be used instead to speed the urgently needed transition to 100% renewable energy, and to help less-developed countries to face the consequences of climate change.

There are reasons for hope. Both solar energy and wind energy are growing at a phenomenal rate, and the transition to 100% renewable energy could be achieved within a very few decades if this growth is maintained. But a level playing field is needed. At present fossil fuel corporations receive half a trillion dollars each year in subsidies. Nuclear power generation is also highly subsidized (and also closely linked to the danger of nuclear war). If these subsidies were abolished, or better yet, used to encourage renewable energy development, the renewables could win simply by being cheaper.<sup>14</sup>

We can also take inspiration from Pope Francis, whose humanitarian vision links the various problems facing us. Pope Francis also shows us what we can do to save the future, and to give both economics and government a social and ecological conscience.

None of us asked to be born in a time of crisis, but history has given great tasks to our generation. We must rise to meet the crisis. We must not fail in our duty to save the gifts of life and civilization that past generations have bequeathed to us. We must not fail in our duty future generations.

---

<sup>13</sup><http://www.fredsakademiet.dk/library/need.pdf>

<sup>14</sup><http://eruditio.worldacademy.org/issue-5/article/urgent-need-renewable-energy>  
<https://www.youtube.com/watch?v=MVwmi7HCmSI>  
<https://www.youtube.com/watch?v=AjZaFjXfLec>  
<https://www.youtube.com/watch?v=m6pFDu7ILV4>  
<https://www.youtube.com/watch?v=MVwmi7HCmSI>  
<http://therightsofnature.org/universal-declaration/>



Figure 11.8: An indigenous girl from South America advocating action to prevent environmental destruction and climate change.



Figure 11.9: Native peoples defending nature.

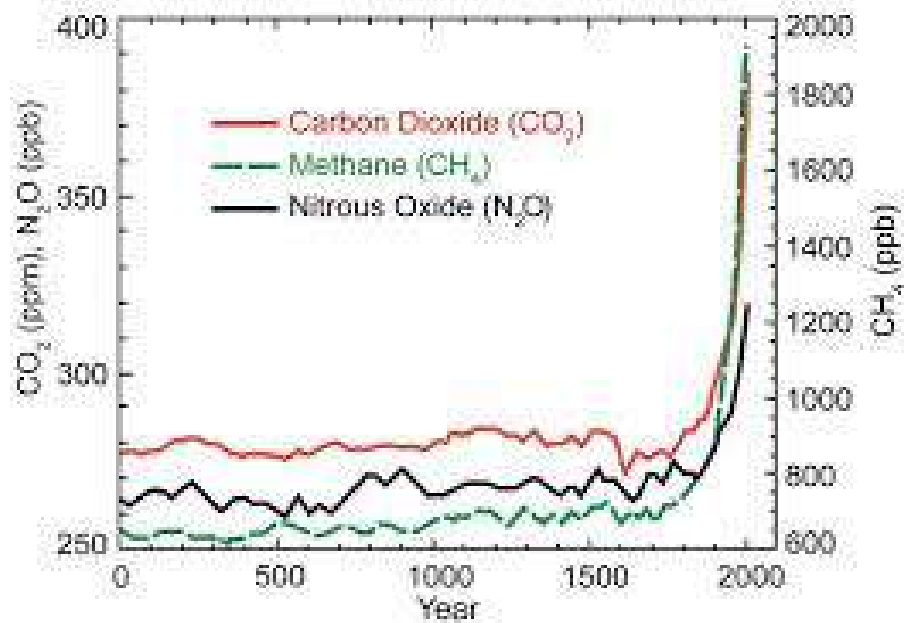


Figure 11.10: Concentrations of the most important greenhouse gasses plotted as functions of time.

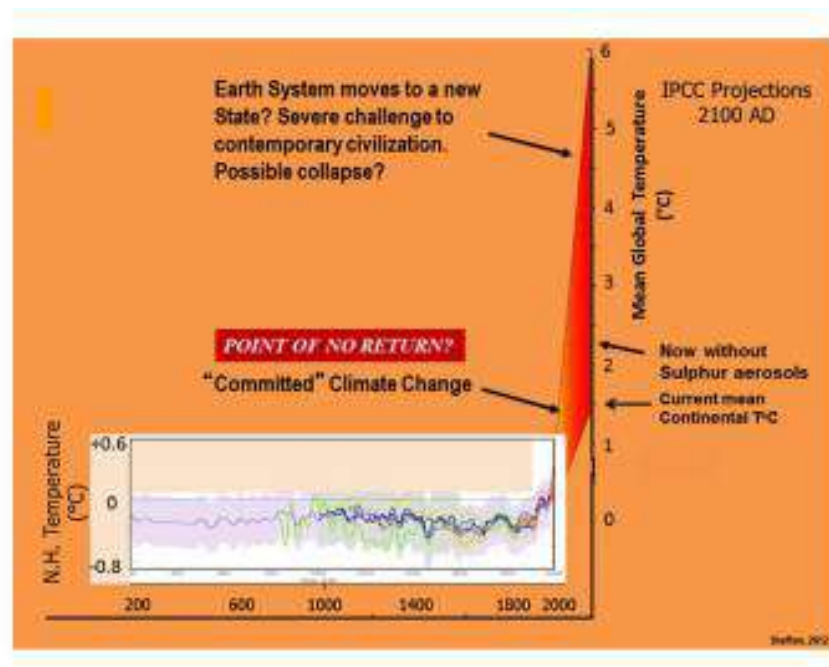


Figure 11.11: Historical and predicted global temperatures.

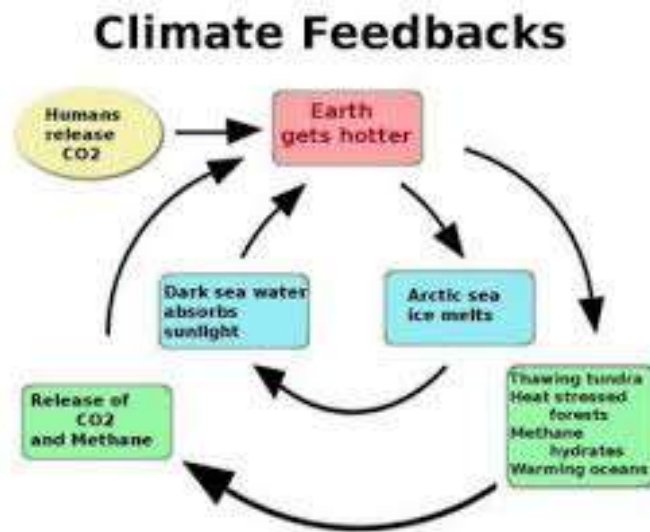


Figure 11.12: Some of the feedback loops involved in climate change.



Figure 11.13: Climate change will produce severe droughts in regions that today produce much of the world's food.



Figure 11.14: **Rising sea levels are already affecting vulnerable parts of the world.**

## Suggestions for further reading

1. David Wasdell, *Arctic Dynamics*,  
<http://www.envisionation.co.uk/index.php/videos/arctic-dynamics>
2. Wikipedia, *Climate change in the Arctic*,
3. World Bank, *Climate Change Report Warns of Dramatically Warmer World This Century*,  
<http://www.worldbank.org/en/news/feature/2012/11/18/Climate-change-report-warns-dramatically-warmer-world-this-century>
4. Wikipedia, *Retreat of glaciers since 1850*,
5. Natural Resources Defense Council, *Climate Change, Water, and Risk: Current water demands are not sustainable*, <http://www.nrdc.org/globalwarming/watersustainability/files/Water>
6. Wikipedia, *2011 East Africa drought*,
7. OXFAM *Working for the Few: Political capture and economic inequality*, <http://www.oxfam.org/en/working-for-the-few>
8. Winnie Byanyima, *Inequality Is Not Inevitable: It's Time to Even It Up!*, Common Dreams <http://www.commondreams.org/views/2014/10/30/inequality-not-inevitable-its-time-even-it>
9. Abarbanel A, McClusky T (1950) *Is the world getting warmer?* Saturday Evening Post, 1 Jul, p22
10. Bagdikian BH (2004) *The New Media Monopoly*. Boston, MA, USA: Beacon
11. Bennett WL (2002) *News: The Politics of Illusion, 5th edition*. New York, NY, USA: Longman
12. Boykoff MT, Boykoff JM (2004) *Balance as bias: global warming and the US prestige press*. Glob Environ Change **14**: 125-136
13. Boykoff MT, Boykoff JM (2007) *Climate change and journalistic norms: A case study of U.S. mass-media coverage*. Geoforum (in press)
14. Carey JW (1989) *Communication as Culture: Essays on Media and Society*. Boston, MA, USA: Unwin Hyman
15. Carvalho A (2005) *Representing the politics of the greenhouse effect: Discursive strategies in the British media*. Critical Discourse Studies **2**: 1-29
16. CEI (2006) *We Call it Life*. Washington, DC, USA: Competitive Enterprise Institute
17. Cowen RC (1957) *Are men changing the earth's weather?* Christian Science Monitor, 4 Dec, p13
18. Cushman JH (1998) *Industrial group plans to battle climate treaty*. New York Times, 26 Apr, p1
19. Doyle G (2002) *Media Ownership: The Economics and Politics of Convergence and Concentration in the UK and European Media*. London, UK: Sage Publications
20. Dunwoody S, Peters HP (1992) *Mass media coverage of technological and environmental risks: A survey of research in the United States and Germany*. Public Underst Sci **1**: 199-230
21. Entman RM (1993) *Framing: toward clarification of a fractured paradigm*. J Commun **43**: 51-58

22. Fleming JR (1998) *Historical Perspectives on Climate Change*. Oxford, UK: Oxford University Press
23. Gelbspan R (1998) *The Heat Is On*. Cambridge, MA, USA: Perseus Books
24. Grove RH (2003) *Green Imperialism*. Cambridge, UK: Cambridge University Press
25. Leggett J (2001) *The Carbon War*. New York, NY, USA: Routledge
26. McChesney RW (1999) *Rich Media, Poor Democracy: Communication Politics in Dubious Times*. Urbana, IL, USA: University of Illinois Press
27. McComas K, Shanahan J (1999) *Telling stories about global climate change: Measuring the impact of narratives on issue cycles*. *Communic Res* **26**: 30-57
28. McCright AM (2007) *Dealing with climate change contrarians*. In Moser SC, Dilling L (eds) *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*, pp 200-212. Cambridge, UK: Cambridge University Press
29. McCright AM, Dunlap RE (2000) *Challenging global warming as a social problem: An analysis of the conservative movement's counter-claims*. *Soc Probl* **47**: 499-522
30. McCright AM, Dunlap RE (2003) *Defeating Kyoto: The conservative movement's impact on U.S. climate change policy*. *Soc Probl* **50**: 348-373
31. Mooney C (2004) *Blinded by science*. *Columbia Journalism Review* 6(Nov/Dec), [www.cjr.org](http://www.cjr.org)
32. NSF (2004) *Science and Engineering Indicators 2004*. Washington, DC, USA: National Science Foundation Project for Excellence in Journalism (2006) *The State of the News Media 2006*. Washington, DC, USA:
33. Project for Excellence in Journalism. [www.stateofthenewsmedia.org](http://www.stateofthenewsmedia.org) Rajan SR (2006) *Modernizing Nature*. Oxford, UK: Oxford University Press
34. Sandell C, Blakemore B (2006) *ABC News reporting cited as evidence in congressional hearing on global warming*. ABC News, 27 Jul, <http://abcnews.go.com>
35. Shabecoff P (1988) *Global warming has begun, expert tells senate*. *New York Times*, 24 Jun, pA1
36. Shrader-Frechette KS (1993) *Burying Uncertainty*. Berkeley, CA, USA: University of California Press
37. Starr P (2004) *The Creation of the Media: Political Origins of Modern Communications*. New York, NY, USA: Basic Books
38. Ungar S (1992) *The rise and (relative) decline of global warming as a social problem*. *Sociol Q* **33**: 483-501
39. Weart SR (2003) *The Discovery of Global Warming*. Cambridge, MA, USA: Harvard University Press
40. Weingart P, Engels A, Pansegrau P (2000) *Risks of communication: Discourses on climate change in science, politics, and the mass media*. *Public Underst Sci* **9**: 261-283
41. Wilkins L (1993) *Between the facts and values: Print media coverage of the greenhouse effect, 1987-1990*. *Public Underst Sci* **2**: 71-84
42. Wilson KM (1995) *Mass media as sources of global warming knowledge*. *Mass Communication Review* **22**: 75-89

43. Wilson KM (2000) *Communicating climate change through the media: Predictions, politics, and perceptions of risks*. In Allan S, Adam B, Carter C (eds) *Environmental Risks and the Media*, pp 201-217. New York, NY, USA: Routledge
44. Zehr SC (2000) *Public representations of scientific uncertainty about global climate change*. *Public Underst Sci* **9**: 85-103

# Chapter 12

## NAOMI KLEIN

### 12.1 From mall-junkie to environmentalist

#### Born into a family of social activists

Naomi Klein was born in 1970 in Montreal, Canada. Her parents had moved there from the United States in 1967 to escape from involvement in the Vietnam War, and they described themselves as ‘hippies’. Naomi’s mother is a feminist film-maker, best known for her anti-pornographic film, *Not A Love Affair*. Her physician father, Michael Klein, is a member of Physicians for Social Responsibility, a branch of International Physicians for the Prevention of Nuclear War (Nobel Peace Prize, 1985). According to Naomi Klein herself, as a child and teenager, she found it “very oppressive to have a very public feminist mother”. As a reaction, she devoted herself to full-time consumerism, spending much of her time at shopping malls.

#### Becoming “less of a brat”

Two events made Naomi Klein become (in her own words) “less of a brat”. As she was preparing for entry as a student at the University of Toronto, her mother had a stroke, and had to be cared for by the family, including Naomi. To do this, all of the family members had to make sacrifices. The second wake-up call was the 1989 massacre of female engineering students at the École Polytechnique. This came during Klein’s first year at the University of Toronto, and it converted her to feminism.

#### Full-time journalism

During her time as a student at the University of Toronto, Naomi Klein served as editor of the student newspaper *The Varsity*, to which she also contributed articles. Attracted to journalism as a career, she dropped out of the university after her third year, and became a full-time writer for *The Globe and Mail*. In 1995 she became the editors of *This Magazine*.

She married Avi Lewis, a well-connected progressive film-maker and television personality with whom she now collaborates.

### Naomi Klein's books and films

- *No Logo*, 1999:
- *Fences and Windows*, 2002:
- *The Take*, 2004:
- *The Shock Doctrine: The Rise of Disaster Capitalism*, 2007:
- *This Changes Everything: Capitalism vs. the Climate*, 2014:
- *No Is Not Enough: Resisting Trump's Shock Politics and Winning the World We Need*, 2017:
- *The Battle for Paradise: Puerto Rico Takes on the Disaster Capitalists*, 2018:
- *On Fire: The (Burning) Case for a Green New Deal*, September, 2019:

### Naomi Klein's articles

- (July 10, 2015). *A radical Vatican?*. The New Yorker. New York City.
- (September 2004). *Baghdad year zero: Pillaging Iraq in pursuit of a neocon utopia*. Harper's Magazine. New York City: 43-53.
- (November 28, 2011). *Capitalism vs. the Climate: What the right gets - and the left doesn't - about the revolutionary power of climate change*. The Nation. New York City.
- (October 29, 2013). *How science is telling us all to revolt*. New Statesman.
- (November 9, 2016). *It was the Democrats' embrace of neoliberalism that won it for Trump*. The Guardian. Kings Place, London.
- (July 3, 2017). *Daring to Dream in the Age of Trump - Resistance is necessary, but it's not enough to win the world we need*. The Nation. New York City.
- (August 3, 2018). *Capitalism Killed Our Climate Momentum, Not, "Human Nature"*. The Intercept.



Figure 12.1: Naomi Klein’s 2014 book, *This Changes Everything: Capitalism vs. the Climate*, was called “the most momentous and contentious environmental book since *Silent Spring*” by New York Times book reviewer Rob Nixon.



Figure 12.2: Poster for the film version of *This Changes Everything*, produced and directed by Naomi Klein's husband, Avi Lewis.

## 12.2 Naomi Klein on the urgency of the Green New Deal

A recent article by journalist Naomi LaChance describes a meeting at the Sanders Institute (founded by Senator Bernie Sanders and his wife Jane) at which the famous author and activist Naomi Klein and others spoke about the scope and urgency of the Green New Deal. Here are some excerpts from the article:

Progressive journalist and activist Naomi Klein urged sweeping change that tackles the climate crisis, capitalism, racism and economic inequality in tandem on Friday in Burlington, Vt. If that seems challenging, add the fact that the clock is ticking<sup>1</sup> and there might not be another chance.

“We need to have started yesterday”, Klein said at the three-day Sanders Institute Gathering on a panel moderated by environmental activist Bill McKibben. “What all of us who follow the science know is that we just can’t lose these four years”, she said, referring to the presidency of climate change denier Donald Trump. The conference, organized by the think tank founded by Vermont Sen. Bernie Sanders’ wife, Jane, is aimed at forming bold progressive agendas for the future.

Progressives are looking to incoming Democratic New York Rep. Alexandria Ocasio-Cortez for leadership as she galvanizes a grassroots effort by the youth-led climate change group Sunrise Movement<sup>2</sup> to reduce fossil fuel dependence. Eighteen members of Congress support the idea of creating a House select committee to look at making a realistic plan by January 2020.

### Uniting for a Green New Deal

Here are excerpts from an article entitled *Uniting for a Green New Deal*, by Margaret Flowers and Kevin Zeese. It was published on January 15, 2019.

Support is growing in the United States for a Green New Deal. Though there are competing visions for what that looks like, essentially, a Green New Deal includes a rapid transition to a clean energy economy, a jobs program and a stronger social safety net.

We need a Green New Deal for many reasons, most obviously the climate crisis and growing economic insecurity. Each new climate report describes the severe consequences of climate change with increasing alarm and the window of opportunity for action is closing. At the same time, wealth inequality is

---

<sup>1</sup><https://www.theguardian.com/environment/2018/oct/08/global-warming-must-not-exceed-15c-warns-landmark-un-report>

<sup>2</sup><https://www.truthdig.com/articles/will-democrats-back-a-green-new-deal/>



Figure 12.3: Award-winning Canadian author Naomi Klein, speaking at the Sanders Institute in January, 2019. Her book *This Changes Everything: Capitalism vs. the Climate* (2014) was a New York Times Bestseller List non-fiction bestseller and the winner of the Hilary Weston Writers' Trust Prize for Nonfiction in its year. In 2016 Klein was awarded the Sydney Peace Prize for her activism on climate justice. Klein frequently appears on global and national lists of top influential thinkers. Writing in the wake of Hurricane Sandy she warned that the climate crisis constitutes a massive opportunity for disaster capitalists and corporations seeking to profit from crisis. But equally, the climate crisis "can be a historic moment to usher in the next great wave of progressive change". On November 9, 2016, following the election of Donald Trump as the 45th President of the United States, Klein called for an international campaign to impose economic sanctions on the United States if his administration refuses to abide by the terms of the Paris Agreement.

also growing. Paul Bucheit writes that more than half of the population in the United States is suffering from poverty.

The Green New Deal provides an opportunity for transformational changes, not just reform, but changes that fundamentally solve the crises we face. This is the time to be pushing for a Green New Deal at all levels, in our towns and cities, states and nationally.

The idea of a Green New Deal seems to have arisen in early 2007 when the Green New Deal Group started meeting to discuss it, specifically as a plan for the United Kingdom. They published their report in July 2008. In April 2009, the United Nations Environmental Program also issued a plan for a global Green New Deal.

In the United States, Barack Obama included a Green New Deal in his 2008 presidential campaign and conservative Thomas Friedman started talking about it in 2007. Howie Hawkins, a Green Party gubernatorial candidate in New York, campaigned on a Green New Deal starting in 2010. Listen to our interview with Hawkins about how we win the Green New Deal on Clearing the FOG. Jill Stein campaigned on it during her presidential runs in 2012 and 2016, as have many Green Party candidates.

Alexandria Ocasio Cortez (AOC), who ran for Congress as a Democrat and won in 2018, has made the Green New Deal a major priority. With the backing of the Sunrise Movement, AOC pushed for a congressional committee tasked with developing a Green New Deal and convinced dozens of members of Congress to support it. Speaker of the House Nancy Pelosi sidelined that idea by creating a climate committee headed by Kathy Castor, which has no mandate to do anything and lacks the power to write legislation and issue subpoenas. Now the Sunrise Movement is planning a tour to build support for the Green New Deal. At each stop they will provide organizing tools to make the Green New Deal a major issue in the 2020 election season.

This week, more than 600 organizations, mostly environmental groups, sent a letter to Congress calling on it to take climate change seriously and design a plan to end dependence on fossil fuels, a transition to 100% clean energy by 2035, create jobs and more. Indigenous leaders are also organizing to urge Congress to pass a Green New Deal that is “Indigenized,” meaning it prioritizes input from and the inclusion of Indigenous Peoples.

## Roosevelt’s original New Deal

In the United States, President Franklin D. Roosevelt was faced with the difficult problems of the depression during his first few years in office. Roosevelt introduced a number of special governmental programs, such as the WPA, the Civilian Construction Corps and the Tennessee Valley Authority, which were designed to create new jobs on projects directed towards socially useful goals - building highways, airfields, auditoriums, harbors, housing projects, schools and dams. The English economist John Maynard Keynes, (1883-1946),



provided an analysis of the factors that had caused the 1929 depression, and a theoretical justification of Roosevelt's policies.

The transition to a sustainable global society will require a similar level of governmental responsibility, although the measures needed are not the same as those which Roosevelt used to end the great depression. Despite the burst of faith in the free market which has followed the end of the Cold War, it seems unlikely that market mechanisms alone will be sufficient to solve problems of unemployment in the long-range future, or to achieve conservation of land, natural resources and environment.

### Honors and awards won by Naomi Klein

- 2014 Hilary Weston Writers' Trust Prize for Nonfiction for *This Changes Everything*
- The Observer 'Book of the Year', *This Changes Everything*
- Book Review '100 Notable Books of the Year', *This Changes Everything*
- Warwick Prize for Writing, for *The Shock Doctrine*
- The New York Times Critics' Pick of the Year, *The Shock Doctrine*
- No Logo - Top 100 Non Fiction books of all-time list (2016), *The Guardian*
- Time magazine's list of Top 100 Non-Fiction books published since 1923, *No Logo*.
- Sydney Peace Prize, 2016
- Honorary doctorate, Saint Thomas University (2011)
- Honorary doctorate, University of Amsterdam (2019)

## 12.3 The Sunrise Movement

The Sunrise Movement is a youth-lead climate activist organization founded in 2017. The movement's website states that "Sunrise is a movement to stop climate change and create



Figure 12.4: Representative Alexandria Ocasio-Cortez addressing a meeting of the Sunrise Movement.

millions of good jobs in the process. We're building an army of young people to make climate change an urgent priority across America, end the corrupting influence of fossil fuel executives on our politics, and elect leaders who stand up for the health and wellbeing of all people.

"We are ordinary young people who are scared about what the climate crisis means for the people and places we love. We are gathering in classrooms, living rooms, and worship halls across the country. Everyone has a role to play. Public opinion is already with us - if we unite by the millions we can turn this into political power and reclaim our democracy.

"We are not looking to the right or left. We look forward. Together, we will change this country and this world, sure as the sun rises each morning."

## Principles of the Sunrise Movement

1. **We are a movement to stop climate change and create millions of good-paying jobs in the process.** We unite to make climate change an urgent priority across America, end the corrupting influence of fossil fuel executives on our politics, and elect leaders who stand up for the health and wellbeing of all people.
2. **We grow our power through talking to our communities.** We talk to our neighbors, families, religious leaders, classmates, and teachers, in order to spread our word. Our strength and work is rooted in our local communities, and we are always growing in number.



Figure 12.5: Banner dropped by the Sunrise Movement on August 23, 2019, across from the Democratic National Committee meeting.

3. **We are Americans from all walks of life.** We are of many colors and creeds, from the plains, mountains, and coasts. A wealthy few want to divide us, but we value each other in our differences and we are united in a shared fight to make real the promise of a society that works for all of us.
4. **We are nonviolent in word and deed.** Remaining nonviolent allows us to win the hearts of the public and welcomes the most people to participate. We need maximum participation in order to achieve our goals.
5. **We tell our stories and we honor each other's stories.** We all have something to lose to climate change, and something to gain in coming together. We tell our individual stories to connect with each other and understand the many different ways this crisis impacts us.
6. **We ask for help and we give what we can.** We all have something to offer to the movement. Some of us give time through volunteering anywhere from 1 to 50 hours per week. Some of us give money. Some of us donate housing or meeting space. We invite our community into the movement by asking for the help we need.
7. **We take initiative.** Any group of 3 people can take action in the name of Sunrise. We ask for advice - not permission - from each other to make this happen. To make decisions, we ask ourselves, "does this bring us closer to our goal?" If yes, we simply do the work that is exciting and makes sense.
8. **We embrace experimentation and we learn together.** We welcome imperfection, share innovations, and learn through honest mistakes followed by honest conversations that help us move forward together. If we see something we don't like, we contribute with something we do like, modeling an alternative.
9. **We take care of ourselves, each other, and our shared home.** We maintain our health of body, mind, spirit, and environment to the best of our ability so that we can maintain a strong movement together. We respect that for each of us this looks different.
10. **We stand with other movements for change.** Stopping climate change requires winning and holding power at every level of government. This is a huge job and we can't do it alone. When it makes sense, we work with other movements who share our values and are also working to win political power.
11. **We shine bright.** There are hard and sad days, to be sure. This isn't easy work. But we strive to bring a spirit of positivity and hope to everything we do. Changing the world is a fulfilling and joyful process, and we let that show

## 12.4 The Extinction Rebellion

Here is a quotation from the organization's website<sup>3</sup>:

"On 31st October 2018, we assembled on Parliament Square in London to announce a Declaration of Rebellion against the UK Government. We were expecting a couple of hundred people. Instead, 1500 came to participate in peaceful civil disobedience. The energy was contagious! The next few weeks were a whirlwind. Six thousand of us converged on London to peacefully block five major bridges across the Thames. We planted trees in the middle of Parliament Square, and dug a hole there to bury a coffin representing our future. We super-glued ourselves to the gates of Buckingham Palace as we read a letter to the Queen. Our actions generated huge national and international publicity and, as news spread, our ideas connected with tens of thousands of people around the world. The XR project was resonating with a deeply felt need for community and solidarity. "We are the ones we've been waiting for," we chanted! Dozens of countries now have groups springing up, from the Solomon Islands to Australia, from Spain to South Africa, the US to India.

"So what's next? We are working relentlessly, building our movement in preparation for phase two, an international rebellion that will begin on 15th April 2019. So come and join us. Rebel for life. For the planet. For our children's children's futures. There is so much work to be done."

### **Demands**

1. Government must tell the truth by declaring a climate and ecological emergency, working with other institutions to communicate the urgency for change.
2. Government must act now to halt biodiversity loss and reduce greenhouse gas emissions to net-zero by 2025.
3. Government must create, and be led by the decisions of, a citizens' assembly on climate and ecological justice.

### **Stated principles**

1. We have a shared vision of change - creating a world that is fit for generations to come. We set our mission on what is necessary - mobilizing 3.5% of the population to achieve system change by using ideas such as "momentum-driven organizing" to achieve this.
2. We need a regenerative culture - creating a culture that is healthy, resilient, and adaptable.
3. We openly challenge ourselves and this toxic system, leaving our comfort zones to take action for change.

---

<sup>3</sup><https://rebellion.earth/the-truth/about-us/>



4. We value reflecting and learning, following a cycle of action, reflection, learning, and planning for more action (learning from other movements and contexts as well as our own experiences).
5. We welcome everyone and every part of everyone - working actively to create safer and more accessible spaces.
6. We actively mitigate for power - breaking down hierarchies of power for more equitable participation.
7. We avoid blaming and shaming - we live in a toxic system, but no one individual is to blame.
8. We are a non-violent network using non-violent strategy and tactics as the most effective way to bring about change.
9. We are based on autonomy and decentralization - we collectively create the structures we need to challenge power. Anyone who follows these core principles and values can take action in the name of RisingUp!"



### Suggestions for further reading

1. *Full text of A Green New Deal* by the Green New Deal Group and published by the New Economics Foundation (2008)
2. UNEP: *Global Green New Deal* at the Library of Congress Web Archives (archived November 12, 2008)
3. Hilary French, Michael Renner and Gary Gardner, *Toward a Transatlantic Green New Deal*, ed. by the Heinrich Böll Foundation and the Worldwatch Institute, PDF, 2009
4. E McGaughey, *Green New Deal: Policies to Stop Climate Damage by 2025* (2019) LawArXiv

# Chapter 13

## HELENA NORBERG-HODGE AND MAUDE BARLOW

### 13.1 Ancient futures

#### We can learn from traditional cultures

Today, the whole world seems to be adopting values, fashions, and standards of behavior presented in the mass media of western society. The unsustainable, power-worshiping, consumption-oriented values of western society are so strongly propagandized by television, films and advertising, that they overpower and sweep aside the wisdom of older societies. This is unfortunate, since besides showing us unsustainable levels of affluence and economic waste, the western mass media depict values and behavior patterns which are hardly worthy of imitation. We need to reverse this trend. The industrialized countries must learn from the values of older traditional cultures. The wisdom of our ancestors, their respect for nature and their hospitable traditions of sharing, can help us to create a new economic system founded on social and environmental ethics.<sup>1</sup> Helena Norbert-Hodge is a leading voice in the ecological movement that acknowledges the wisdom of ancient cultures. She is the founder and director of the International Society for Ecology and Culture, whose name has now been changed to Ancient Futures.

#### Education

Born in Sweden in 1946, Helena Norberg-Hodge was educated in Sweden, Germany, Austria, England and the United States. She studied linguistics at the Ph.D. level under Prof. Noam Chomsky at MIT, and is fluent in seven languages. She has studies the cultures of many countries, both industrialized and non-industrialized.

---

<sup>1</sup><http://www.learndev.org/dl/harmony8.pdf>  
<http://dissidentvoice.org/2015/05/gandhi-as-an-economist/>  
<http://www.encyclopedia.com/doc/1G2-3401804813.html>



Figure 13.1: Helena Norberg-Hodge (born in 1946) is the founder and director of Local Futures, which was previously named International Society for Ecology and Culture. She states that the organization is “dedicated to the revitalization of cultural and biological diversity, and the strengthening of local communities and economies worldwide”. In her important book, *Ancient Futures*, Norberg-Hodge says that modern industrial societies ought to learn from more sustainable traditional cultures, rather than the reverse.



Figure 13.2: Helena Norberg-Hodge gained much insight from her work in Ladakh.



Figure 13.3: Another view of Ladakh. Although politically a part of India, Ladakh is culturally and physically more similar to Tibet.

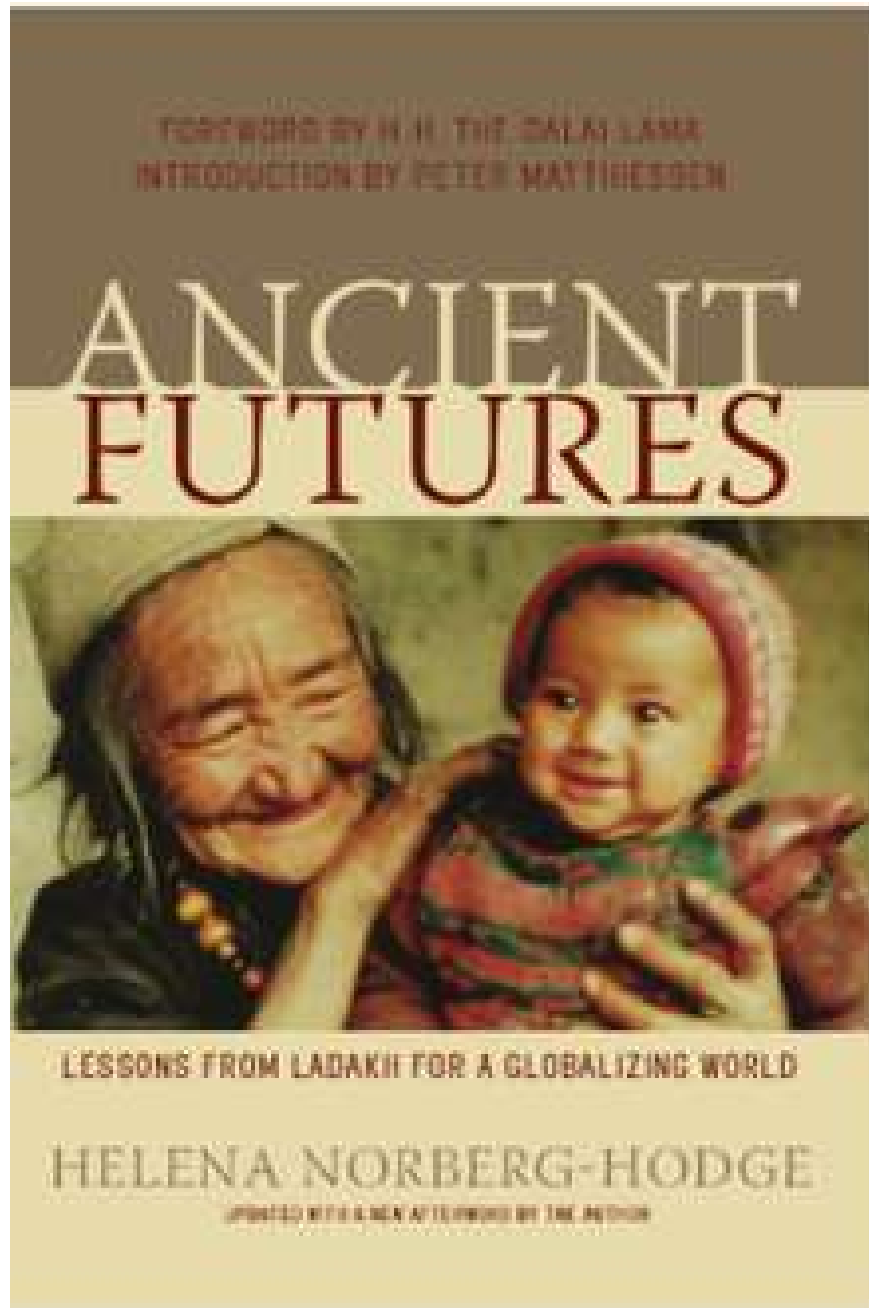


Figure 13.4: Cover for the 2009 edition of *Ancient futures*.

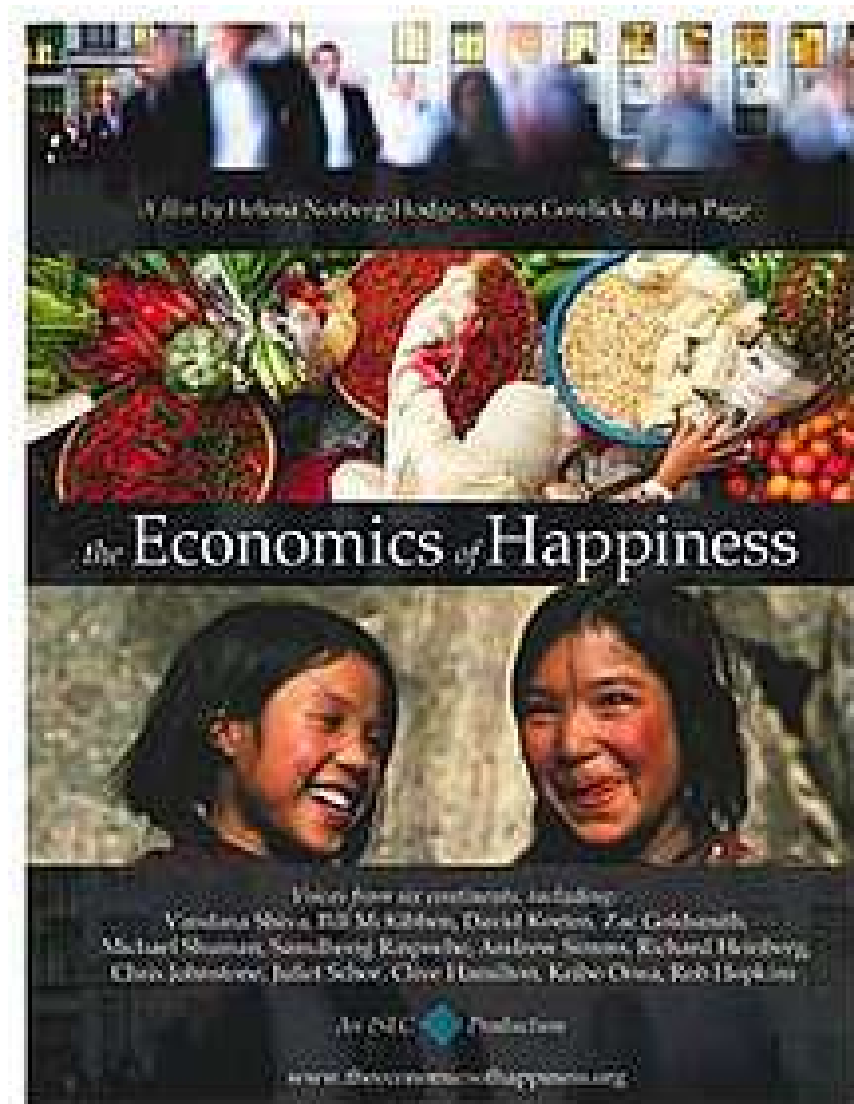


Figure 13.5: In 2011, Helena Norberg-Hodge produced the award-winning film, *The Economics of Happiness*. The synopsis states that “The film features many voices from six continents calling for systemic economic change. The documentary describes a world moving simultaneously in two opposing directions. While government and big business continue to promote globalization and the consolidation of corporate power, people around the world are resisting those policies and working to forge a very different future. Communities are coming together to re-build more human scale, ecological economies based on a new paradigm: an economics of localization.”

## Observations in Ladakh

Helena Norberg-Hodge observed that the original culture of Ladakh had much to recommend it, but it broke down rapidly under the impact of economic forces when the country was opened to the outside world. She remembered that “When I first arrived in Leh, the capital of 5,000 inhabitants, cows were the most likely cause of congestion and the air was crystal clear. Within five minutes’ walk in any direction from the town centre were barley fields, dotted with large farmhouses. For the next twenty years I watched Leh turn into an urban sprawl. The streets became choked with traffic, and the air tasted of diesel fumes. ‘Housing colonies’ of soulless, cement boxes spread into the dusty desert. The once pristine streams became polluted, the water undrinkable. For the first time, there were homeless people. The increased economic pressures led to unemployment and competition. Within a few years, friction between different communities appeared. All of these things had not existed for the previous 500 years.

“In one of my first years in Ladakh, I was in this incredibly beautiful village. All the houses were three stories high and painted white. And I was just amazed. So out of curiosity I asked a young man from that village to show me the poorest house. He thought for a bit, and then he said, ‘We don’t have any poor houses.’ The same person I heard eight years later saying to a tourist, ‘Oh, if you could only help us Ladakhis, we’re so poor!’ And what had happened is that in the intervening eight years he had been bombarded with all these one-dimensional images of life in the West. He’d seen people with fast cars, you know, looking as though they never worked, and with lots of money. And suddenly by comparison his culture seemed backward and primitive and poor”

## Books, articles and book chapters by Norberg-Hodge

Helena Norberg-Hodge is the author of the important book, *Ancient Futures: Learning from Ladakh* It was published by the Sierra Club in 1991. The book was very well received, and has remained in print ever since. *Ancient Futures* and its film version have been translated into more than 40 languages.

Norberg-Hodge is also the co-author of *Bringing the Food Economy Home: Local Alternatives to Global Agribusiness*, published by Kumarian in 2002, and *From the Ground Up: Rethinking Industrial Agriculture*, Zed Books, 1992. Her articles and book chapters are listed below.

- *Localization and the Economics of Happiness*, Soka Gakkai International, March 2017
- *Strengthening Local Economies: The Path to Peace?*, Tikkun, July 29, 2015
- *A New Call for Resistance and Renewal*, Resurgence, July-August 2015
- *The Economics of Climate Change* Ecotrust, February 23, 2015
- *The North-South Divide* The Ecologist magazine, June 22, 2008.
- *Encouraging Diversity and Sustainability through Localisation* World Women’s Forum 2008.
- *The Economics of Happiness* Resurgence magazine, November/December 2007.



Figure 13.6: **Helena Norberg-Hodge today.**

- *Thinking Globally, Eating Locally* Totnes Transition Town Guide, 2007.
- *Going Local* Kindred magazine, December 2007
- *Poverty and the Buddhist Way of Life. Ecology and Buddhism in the Knowledge-based Society*, May 2006

## Lectures

Wikipedia states that “Norberg-Hodge lectures extensively in English, Swedish, German, French, Spanish, Italian and Ladakhi. Over the years, lecture tours have brought her to universities, government agencies and private institutions. She has made presentations to parliamentarians in Germany, Sweden, and England; at the White House and the US Congress; to UNESCO, the World Bank and the IMF; and at Cambridge, Oxford, Harvard, Cornell and numerous other universities. She also teaches regularly at Schumacher College in England. She frequently lectures and gives workshops for community groups around the world working on localization issues.”

## Some Norberg-Hodge quotations

Here are a few more things that she said:

**If our starting point is a respect for nature and people, diversity is an inevitable consequence. If technology and the needs of the economy are our**

starting point, then we have what we are faced with today - a model of development that is dangerously distanced from the needs of particular peoples and places and rigidly imposed from the top down.

The old culture reflected fundamental human needs while respecting natural limits. And it worked. It worked for nature, and it worked for people. The various connecting relationships in the traditional system were mutually reinforcing, encouraging harmony and stability.

Globalization, which attempts to amalgamate every local, regional, and national economy into a single world system, requires homogenizing locally adapted forms of agriculture, replacing them with an industrial system-centrally managed, pesticide-intensive, one-crop production for export-designed to deliver a narrow range of transportable foods to the world market.

I have seen that community and a close relationship with the land can enrich human life beyond all comparison with material wealth or technological sophistication. I have learned that another way is possible.

Throughout the world today there is a growing awareness of the failings of the Western model of development and a corresponding desire to look for more human-scale, ecological ways of living.

Economic localization is the key to sustaining biological and cultural diversity - to sustaining life itself. The sooner we shift towards the local, the sooner we will begin healing our planet, our communities and ourselves.

It may seem absurd to believe that a 'primitive' culture in the Himalaya has anything to teach our industrialized society. But our search for a future that works keeps spiraling back to an ancient connection between ourselves and the earth, an interconnectedness that ancient cultures have never abandoned.

## 13.2 Maude Barlow: water as a human right

### Leader in the struggle against the commodification of water

In many countries, large corporations have taken control of water supplies, and are now selling water at prices that poor citizens cannot afford. Maude Barlow, born in 1947 in Canada, is leading the struggle against the commodification of water. As the result of her campaign, the United Nations has declared water to be a human right. This is particularly important at a time when fresh water is becoming increasingly scarce.

Wikipedia states that "Maude Barlow is the recipient of 12 honorary doctorates as

well as many awards, including the 2005 Right Livelihood Award, the Citation of Lifetime Achievement which she received at the 2008 Canadian Environment Awards, the 2009 Earth Day Canada Outstanding Environmental Achievement Award, the 2009 Planet in Focus Eco Hero Award, and the 2011 EarthCare Award, the highest international honour of the Sierra Club (U.S.).”

### Books with Maude Barlow as author, co-author or contributor

- *Parcel of Rogues: How Free Trade Is Failing Canada* - Key Porter Books, Toronto (1990)
- *Take Back the Nation* (with Bruce Campbell) - Key Porter Books, Toronto (1992)
- *Take Back the Nation 2* (with Bruce Campbell) - Key Porter Books, Toronto (1993)
- *Class Warfare: The Assault on Canada's Schools* (with Heather-Jane Robertson) - Key Porter Books, Toronto (1994) ISBN 1-55013-559-7.
- *Straight through the Heart: How the Liberals Abandoned the Just Society* (with Bruce Campbell) - Harper Collins, Toronto (1995).
- *The Big Black Book: The Essential Views of Conrad and Barbara Amiel Black* (with Jim Winter) - Stoddart, Toronto (1997).
- *MAI: The Multilateral Agreement on Investment and the Threat to Canadian Sovereignty* (with Tony Clarke) - Stoddart (1997).
- *MAI: The Multilateral Agreement on Investment and the Threat to American Freedom* (with Tony Clarke) - Stoddart, Toronto (1998)
- *The Fight of My Life: Confessions of an Unrepentant Canadian* - Harper Collins, Toronto (1998).
- *MAI: The Multilateral Agreement on Investment Round 2; New Global and Internal Threats to Canadian Sovereignty* (with Tony Clarke) - Stoddart, Toronto (1998)
- *Frederick Street: Life and Death on Canada's Love Canal* (with Elizabeth May) - Harper Collins, Toronto (2000)
- *Global Showdown: How the New Activists Are Fighting Global Corporate Rule* (with Tony Clarke) - Stoddart, Toronto (2001).
- *Blue Gold: The Battle Against Corporate Theft of the World's Water* (with Tony Clarke) - Stoddart, Toronto (2002).
- *Profit Is Not the Cure: A Citizen's Guide to Saving Medicare* - McClelland & Stewart, Toronto (2002).
- *Too Close For Comfort; Canada's Future Within Fortress North America* - McClelland & Stewart, Toronto (2005).
- *Blue Covenant: The Global Water Crisis and the Fight for the Right to Water* - McClelland & Stewart, Toronto (October 16, 2007). Also available in French, Arabic, Japanese, Portuguese, Korean, Greek, Turkish, and Spanish.
- *Blue Future: Protecting Water for People and the Planet Forever* - House of Anansi, Inc., Toronto (September 2013).
- *Boiling Point: Government Neglect, Corporate Abuse, and Canada's Water Crisis* - ECW Press, Toronto (September 2016).



Figure 13.7: Maude Barlow (born 1947). The Wikipedia article on her states that she is a “Canadian author and activist. She is the National Chairperson of the Council of Canadians, a citizens’ advocacy organization with members and chapters across Canada. She is also the co-founder of the Blue Planet Project, which works internationally for the human right to water. Maude chairs the board of Washington-based Food and Water Watch, is a founding member of the San Francisco-based International Forum on Globalization, and a Councillor with the Hamburg-based World Future Council. In 2008/2009, she served as Senior Advisor on Water to the 63rd President of the United Nations General Assembly and was a leader in the campaign to have water recognized as a human right by the UN. She has authored and co-authored 16 books.” Maude Barlow’s work on the issue of water is especially important because fresh water is becoming increasingly scarce throughout the world.

- *The Silent Revolution: Media, Democracy, and the Free Trade Debate*. University of Ottawa Press, Ottawa. (1990).
- *Trading Freedom: How Free Trade Affect our Lives, Work, and Environment* - Institute for Policy Studies, Washington (1992)
- *The American Review of Canadian Studies* - Twentieth Anniversary Issue of The Association for Canadian Studies in the United States, Washington (1992)
- *Crossing the Line: Canada and Free Trade With Mexico*- New Star Publications, Vancouver (1992)
- *The Charlottetown Accord, the Referendum, and the Future of Canada* - University of Toronto Press, Toronto (1993)
- *The Trojan Horse: Alberta and the Future of Canada* - Black Rose Books, Edmonton (1995)-
- *The Case Against the Global Economy* - Sierra Club Books, New York (1996)
- *Globalization and the Live Performing Arts, Conference Papers* - Monash University, Melbourne (2001)
- *Alternatives to Economic Globalization, a Report of the International Forum on Globalization* - Berrett-Koehler Publishers, San Francisco (2002)-
- *Whose Water Is It? The Unquenchable Thirst of a Water-Hungry World* - Edited by Bernadette McDonald and Douglas Jehl, National Geographic, Washington (2003)
- *Meeting the Global Challenge: Competitive Position and Strategic Response* - BMA Program, Edited by Tom Wesson, York University Press, Toronto (2004)
- *Globalization, Human Rights & Citizenship, An Anthology From the Gannett Lecture Series* - Rochester Institute of Technology, Edited by Robert Manning - trade paperback (2005)

## Reports

- *Blue Gold: The Global Water Crisis and the Commodification of the World's Water Supply* - International Forum on Globalization, San Francisco (June 1999) See also: Commodification of water
- *The Free Trade Area of the Americas, The Threat to Social Programs, Environmental Sustainability and Social Justice* - International Forum on Globalization, San Francisco (February 2001)
- *The World Trade Organization and the Threat to Canada's Social Programs* - The Council of Canadians, Ottawa (September 2001)
- *Profit is not the Cure: A Call to Action on the Future of Health Care in Canada* - The Council of Canadians, Ottawa (Winter 2002)
- *Making the Links, A Citizen's Guide to the World Trade Organization and the Free Trade Area of the Americas* (with Tony Clarke) - The Council of Canadians, Ottawa (Summer 2003)
- *The Global Fight Against Privatization of Water* - Annual Report, The World Forum on Alternatives, Geneva (April 2004)
- *The Canada We Want, A Citizen's Alternative to Deep Integration* - The Council of Canadians, Ottawa (March 2004)

## A few things that Maude Barlow has said

Unlimited growth assumes unlimited resources, and this is the genesis of Ecocide.

Do not listen to those who say there is nothing you can do to the very real and large social and environmental issues of our time.

Everything is now for sale. Even those areas of life that we once considered sacred like health and education, food and water and air and seeds and genes and a heritage. It is all now for sale.

There is simply no way to overstate the water crisis of the planet today.

We are committed with our lives to building a different model and a different future for humanity, the Earth, and other species. We have envisaged a moral alternative to economic globalization and we will not rest until we see it realized.

The destruction of aquatic ecosystem health, and the increasing water scarcity, are in my opinion the most pressing environmental problems facing human kind.

No piecemeal solution is going to prevent the collapse of whole societies and ecosystems ... a radical re-thinking of our values, priorities and political systems is urgent.

At the heart of the WTO is an assault on everything left standing in the commons, in the public realm. Everything is now for sale. Even those areas of life that we once considered sacred like health and education, food and water and air and seeds and genes and a heritage. It is all now for sale. Economic freedom - not democracy, and not ecological stewardship - is the defining metaphor of the WTO and its central goal is humanity's mastery of the natural world through its total commodification.

Robert Glennon is a leading-edge legal scholar and passionate water advocate whose thinking is central to an intense debate on the path forward to a water-secure world. I heartily recommend his provocative, information-packed, and highly readable new book *Unquenchable*.



Figure 13.8: Lester R. Brown: “Water will be the most critical resource.”

### 13.3 The global water crisis

#### Falling water tables in China may cause famine in Africa

After a lecture at the University of Copenhagen in the 1980's, Lester R. Brown of the Earth Policy Institute was asked which resource would be the first to become critically scarce. Everyone in the audience expected him to say “oil”, but instead he said “fresh water”. He went on to explain that falling water tables in China would soon make China unable to feed its population. This would not cause famine in China itself because of the strength of the Chinese economy, which would allow the Chinese to purchase grain on the world market. However, shortages of fresh water in China would indeed cause famine, for example in Africa, because Chinese demand for grain would raise prices on the world market beyond the ability of poor countries to pay.

#### Predictions of drought in the Stern Review

According to a report presented to the Oxford Institute of Economic Policy by Sir Nicholas Stern on 31 January, 2006, areas likely to lose up to 30% of their rainfall by the 2050's because of climate change include much of the United States, Brazil, the Mediterranean region, Eastern Russia and Belarus, the Middle East, Southern Africa and Southern Australia. Meanwhile rainfall is predicted to increase up to 30% in Central Africa, Pakistan, India, Bangladesh, Siberia, and much of China.

Stern and his team point out that “We can... expect to see changes in the Indian monsoon, which could have a huge impact on the lives of hundreds of millions of people in India, Pakistan and Bangladesh. Most climate models suggest that the monsoon will change, although there is still uncertainty about exactly how. Nevertheless, small changes in the monsoon could have a huge impact. Today, a fluctuation of just 10% in either direction from average monsoon rainfall is known to cause either severe flooding or drought. A weak summer monsoon, for example, can lead to poor harvests and food shortages among

the rural population - two-thirds of India's almost 1.1 billion people. Heavier-than-usual monsoon downpours can also have devastating consequences..."

In some regions, melting of glaciers can be serious from the standpoint of dry-season water supplies. For example, melts from glaciers in the Hindu Kush and the Himalayas now supply much of Asia, including China and India, with a dry-season water supply. Complete melting of these glacial systems would cause an exaggerated runoff for a few decades, after which there would be a drying out of some of the most densely populated regions of the world.

### **Ocean current changes and failure of monsoons**

It is expected that climate change will affect ocean currents, and hence also affect monsoon rainfall. We are already experiencing a diversion of the Gulf Stream due to southward currents of cold water from melting ice in the Arctic. This has caused what is known as the *North Atlantic Anomaly*. While most regions of the world are experiencing rising temperatures, the North Atlantic and several northern European countries are exceptions to this rule, and have cooled. Complete failure of the Gulf Stream would lead to much colder temperatures in Europe.

Changes in ocean currents have already lead to the failure of the West African Monsoon, and this has already produced severe food insecurity in West Africa.

In the future, climate-changed ocean currents may lead to failures of monsoons in South-east Asia, and thus damage the food supply of almost two billion people.

### **Falling water tables around the world**

Under many desert areas of the world are deeply buried water tables formed during glacial periods when the climate of these regions was wetter. These regions include the Middle East and large parts of Africa. Water can be withdrawn from such ancient reservoirs by deep wells and pumping, but only for a limited amount of time.

In oil-rich Saudi Arabia, petroenergy is used to drill wells for ancient water and to bring it to the surface. Much of this water is used to irrigate wheat fields, and this is done to such an extent that Saudi Arabia exports wheat. The country is, in effect, exporting its ancient heritage of water, a policy that it may, in time, regret. A similarly short-sighted project is Muammar Qaddafi's enormous pipeline, which will bring water from ancient sub-desert reservoirs to coastal cities.

In the United States, the great Ogallala aquifer is being overdrawn. This aquifer is an enormous stratum of water-saturated sand and gravel under-lying parts of northern Texas, Oklahoma, New Mexico, Kansas, Colorado, Nebraska, Wyoming and South Dakota. The average thickness of the aquifer is about 70 meters. The rate of water withdrawal from the aquifer exceeds the rate of recharge by a factor of eight.

Thus we can see that in many regions, the earth's present population is living on its inheritance of water, rather than its income. This fact, coupled with rapidly increasing populations and climate change, may contribute to a very serious food crisis partway through



Figure 13.9: **Water stress per country.**

the 21st century.

### Glacial melting and summer water supplies

The summer water supplies of both China and India are threatened by the melting of glaciers. The Gangotri glacier, which is the principle glacier feeding India's great Ganges River, is reported to be melting at an accelerating rate, and it could disappear within a few decades. If this happens, the Ganges could become seasonal, flowing only during the monsoon season. Chinese agriculture is also threatened by disappearing Himalayan glaciers, in this case those on the Tibet-Quinghai Plateau. The respected Chinese glaciologist Yao Tandong estimates that the glaciers feeding the Yangtze and Yellow Rivers are disappearing at the rate of 7% per year.<sup>2</sup>

### How many people are currently under stress?

It is estimated that two thirds of the world's peoples currently live under water stress for at least one month each year. Half a billion people now suffer from water shortages and stress for the entire year. Half of the world's large cities are currently plagued by water scarcity, and the situation is expected to get worse.

### Dangers from water wars

Water plays a role in present conflicts, for example in the conflict between the government of Israel and the country's Palistinian polulation. In the future, there may be many other conflicts over water, for example between China and India. China is building a canal to take water from the Tibetan Plateau to Beijing, thus reducing the amount of water in

<sup>2</sup><http://www.commondreams.org/news/2015/08/04/global-glaciers-melting-three-times-rate-20th-century>

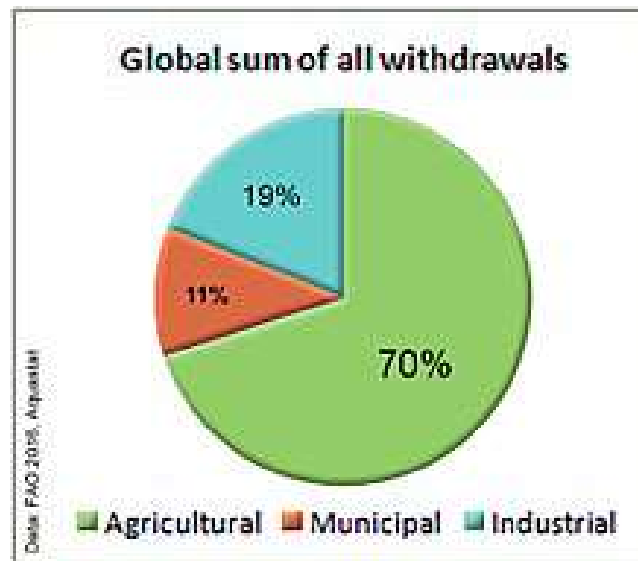


Figure 13.10: Global use of fresh water (FAO data).



Figure 13.11: In Meatu district, Simiyu Region, Tanzania (Africa), water most often comes from open holes dug in the sand of dry riverbeds, and it is invariably contaminated. Many children are deprived of an education primarily due to this daily task.



Figure 13.12: In 2012 in Sindh, Pakistan a shortage of clean water led people to queue to collect it where available.



Figure 13.13: Deforestation of the Madagascar Highland Plateau has led to extensive siltation and unstable flows of western rivers.



Figure 13.14: A South Asian woman carrying water on her head, 2016.

rivers flowing down from the plateau into India. Other dangerous water conflicts loom in regions such as Sudan.

## Advances in desalination technology

Scientists at the Massachusetts Institute of Technology have developed a new desalination process, called shock electrodialysis. In this process, water flows through a porous material - in this case, made of tiny glass particles, called a frit - with membranes or electrodes sandwiching the porous material on each side. When an electric current flows through the system, the salty water divides into regions where the salt concentration is either depleted or enriched. When that current is increased to a certain point, it generates a shockwave between these two zones, sharply dividing the streams and allowing the fresh and salty regions to be separated by a simple physical barrier at the center of the flow.

“It generates a very strong gradient,” says Martin Bazant, a researcher involved with the project<sup>3</sup>.

Even though the system can use membranes on each side of the porous material, Bazant explains, the water flows across those membranes, not through them. That means they are not as vulnerable to fouling - a buildup of filtered material - or to degradation due to water pressure, as happens with conventional membrane-based desalination, including conventional electrodialysis. “The salt doesn’t have to push through something,” Bazant says. “The charged salt particles, or ions, just move to one side”.

## Suggestions for further reading

1. C., Biswas, A., and Cline, S., eds. 2010. *Global Change: Impacts on Water and Food Security*. Heidelberg: Springer.
2. Steven Solomon (2010). *Water: The Epic Struggle for Wealth, Power, and Civilization*. Harper.
3. Alexander Bell (2009). *Peak Water : Civilisation and the world’s water crisis*. Edinburgh: Luath.
4. Peter H. Gleick, ed. (2009). *The World’s Water 2008-2009: The Biennial Report on Freshwater Resources*. Washington D.C. : Island Press.
5. Maude Barlow (2007). *Blue covenant : the global water crisis and the coming battle for the right to water*. New York : New Press : Distributed by W.W. Norton.
6. Richard Heinberg (2007). *Peak Everything: Waking Up to the Century of Declines*. Gabriola, BC : New Society Publishers.
7. Engelbert, Ernest A.; Ann Foley Scheuring, eds. (c. 1984). *Water Scarcity: Impacts on Western Agriculture*. Berkeley: University of California Press.
8. Jameel M. Zayed. *No Peace Without Water - The Role of Hydropolitics in the Israel-Palestine Conflict*. London.

---

<sup>3</sup> He was quoted in an article published in *MIT News*, November 12, 2015



## Chapter 14

# SIR DAVID ATTENBOROUGH

### 14.1 Family background and childhood

David Attenborough grew up in an academic environment. He lived with his family in College House on the campus of University College, Leicester, where his father, Frederick, was the Principal. The college developed into the University of Leicester, and Attenborough Tower, the tallest structure on its campus, commemorates the university's association with the Attenborough family.

Even as a very young boy, David Attenborough was strongly interested in natural history. He collected fossils, stones, and natural specimens of all kinds. When David was seven years old, Jacquetta Hawkes, who was then 23, admired his “museum” and encouraged him to continue collecting. Jacquetta, who was the daughter of the Nobel Laureate biochemist Sir Frederick Gowland Hopkins, later became a well-known archaeologist.

When he was 10 years old, David Attenborough heard a lecture by the Canadian ecologist and conservationist “Grey Owl”. According to his brother Richard, who also attended the lecture, David was “bowled over by the man’s determination to save the beaver, by his profound knowledge of the flora and fauna of the Canadian wilderness and by his warnings of ecological disaster should the delicate balance between them be destroyed. The idea that mankind was endangering nature by recklessly despoiling and plundering its riches was unheard of at the time, but it is one that has remained part of Dave’s own credo to this day.” Richard Attenborough later produced a documentary film on the life of “Grey Owl”.

Between 1945 and 1947, David Attenborough studied zoology at the University of Cambridge. In 1947 he was called up for military service, and spent the next two years in the Royal Navy.

After leaving the navy, Attenborough worked for a period as an editor of children’s books. However, this job did not satisfy him, and he applied to the BBC for a position as a radio broadcaster. Although he didn’t get the job for which he originally applied, his resumé came to the attention of the BBC’s newly-formed television division, which offered him the chance to take a course on television broadcasting.



Figure 14.1: The Attenborough Tower at the University of Leicester now houses the university's College of Social Sciences.



Figure 14.2: The Canadian environmentalist, Archibald Belaney (1888-1938), who liked to call himself “Grey Owl”. At the age of 10, David Attenborough heard him speak on the need to protect the natural world from excessive human development. This lecture made an extremely strong impression on the young David.



Figure 14.3: Lord Richard Attenborough (1923-2014), David Attenborough's elder brother, seen here together with his wife. In 1993 he was awarded a life peerage because of his contributions to cinema. He is especially remembered for his iconic film *Gandhi*.

## 14.2 Career at the BBC

Sir David Attenborough's films which have been broadcast by the BBC

- Life on Earth (1979)
- The Living Planet (1984)
- The Trials of Life (1990)
- Life in the Freezer (1993)
- The Private Life of Plants (1995)
- The Life of Birds (1998)
- The Life of Mammals (2002)
- Life in the Undergrowth (2005)
- Life in Cold Blood (2008)
- Zoo Quest (1954-63)
- The People of Paradise (1960)
- The World About Us (1967)
- The Miracle of Bali (1969)
- The Tribal Eye (1975)
- Wildlife on One (1977)
- The First Eden (1987)
- Lost Worlds, Vanished Lives (1989)
- BBC Wildlife Specials (1995-2008)
- The Lost Gods of Easter Island (2000)
- State of the Planet (2000)
- The Blue Planet (2001)
- Planet Earth (2006)
- Are We Changing Planet Earth? (2006)
- Charles Darwin and the Tree of Life (2009)
- Nature's Great Events (2009)
- Life (2009)
- First Life (2010)
- Madagascar (2011)
- Frozen Planet (2011)
- Attenborough: 60 Years in the Wild (2012)
- Africa (2013)
- David Attenborough's Natural Curiosities (episodes) (2013-)
- David Attenborough's Rise of Animals: Triumph of the Vertebrates (2013)
- When Björk Met Attenborough (2013)
- Life Story (2014) The Hunt (2015)
- Great Barrier Reef (2015)
- Planet Earth II (2016)
- Blue Planet II (2017)

- Dynasties (2018)
- Our Planet (2019)
- Climate Change - The Facts (2019)
- Flying Monsters 3D (2010)
- The Penguin King (2011)
- Kingdom of Plants 3D (2012)
- Galapagos 3D (2013)
- David Attenborough's Natural History Museum Alive (2014)

### Books by Sir David Attenborough

- Zoo Quest to Guyana (1956)
- Zoo Quest for a Dragon (1957) - republished in 1959 to include an additional 85 pages titled Quest for the Paradise Birds
- Zoo Quest in Paraguay (1959)
- Quest in Paradise (1960)
- People of Paradise (1960)
- Zoo Quest to Madagascar (1961)
- Quest Under Capricorn (1963)
- Fabulous Animals (1975)
- The Tribal Eye (1976)
- Life on Earth (1979)
- Discovering Life on Earth (1981)
- The Living Planet (1984)
- The First Eden: The Mediterranean World and Man (1987)
- The Atlas of the Living World (1989)
- The Trials of Life (1990)
- The Private Life of Plants (1994)
- The Life of Birds (1998)
- The Life of Mammals (2002)
- Life on Air: Memoirs of a Broadcaster (2002) - autobiography, revised in 2009
- Life in the Undergrowth (2005)
- Amazing Rare Things: The Art of Natural History in the Age of Discovery (2007) - with Susan Owens, Martin Clayton and Rea Alexandratos
- Life in Cold Blood (2007)
- David Attenborough's Life Stories (2009)
- David Attenborough's New Life Stories (2011)
- Drawn From Paradise: The Discovery, Art and Natural History of the Birds of Paradise (2012) - with Errol Fuller
- Adventures of a Young Naturalist: The Zoo Quest Expeditions (2017)
- Journeys to the Other Side of the World: Further Adventures of a Young Naturalist (2018)

- **Dynasties: The Rise and Fall of Animal Families with Stephen Moss (BBC Books, 2018)**

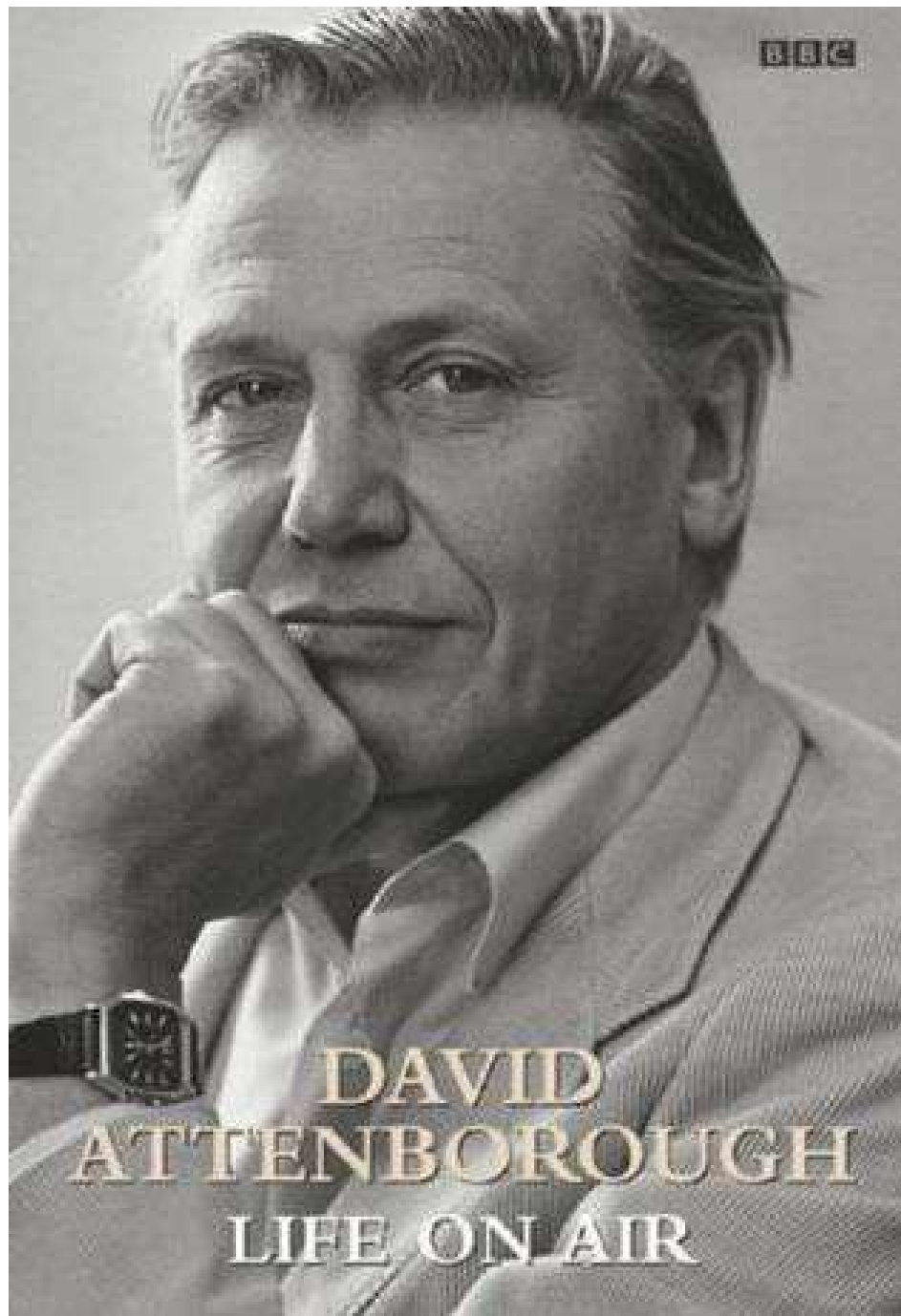
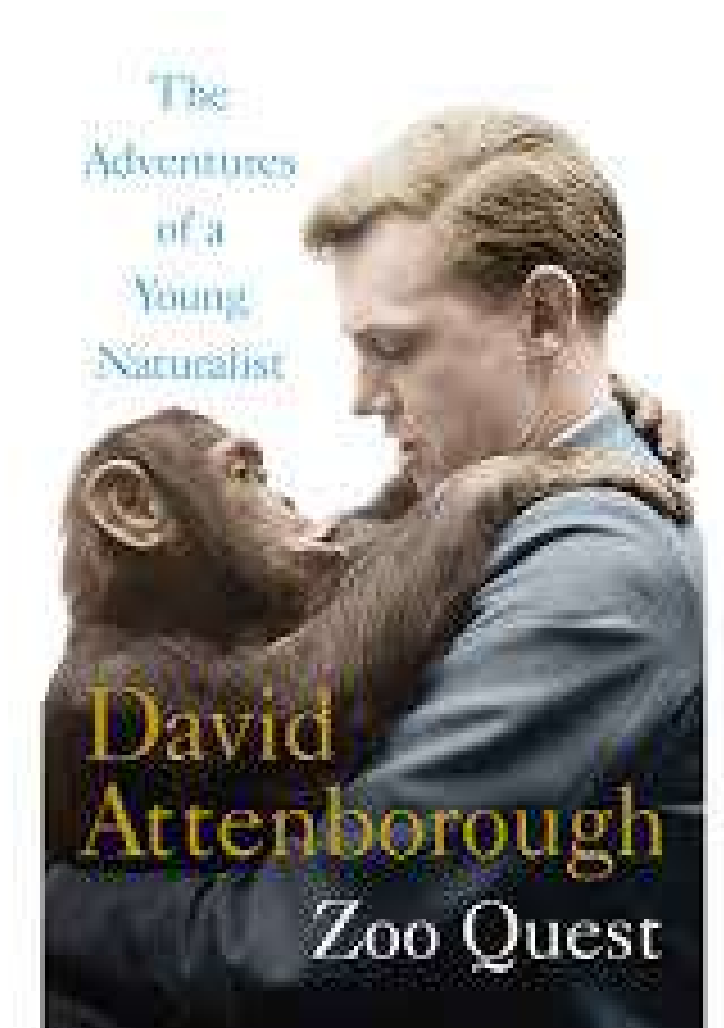


Figure 14.4: David Attenborough's highly entertaining autographical book about his career at the BBC.





## 14.3 Disaster!

In a 2011 interview in *The Guardian*, Sir David Attenborough was asked: “What will it take to wake people up about climate change?”. He replied “Disaster. It’s a terrible thing to say, isn’t it? And even disaster doesn’t always do it. I mean, goodness me, there have been disasters in North America, with hurricanes, and one thing and another, and floods; and still a lot of people would deny it, and say it’s nothing to do with climate change. Well it visibly has to do with climate change!”

Sir David Attenborough’s almost unbelievably enormous and impressive opus of television programs about the natural world have helped to raise public awareness of the importance of the natural environment. He also has made a number of television programs specifically related to questions such as saving threatened species, the dangers of exploding global human populations, and the destruction of forests for the sake of palm oil plantations.

Let us return to *The Guardian*’s 2011 interview with Sir David. Had it been made in the autumn of 2017, the interview would certainly have included a discussion of recent hurricanes of unprecedented power and destructiveness, such as Harvey, Irma and Maria, as well as 2017’s wildfires and Asian floods. It is possible that such events, which will certainly become more frequent and severe during the next few years, will provide the political will needed to silence climate change denial, to stop fossil fuel extraction, and to promote governmental policies favoring renewable energy.

Although the mass media almost have entirely neglected the link between climate change and recent disastrous hurricanes, floods droughts and wildfires, many individuals and organizations emphasized the cause and effect relationship. For example, UK airline billionaire Sir Richard Branson, whose Caribbean summer residence was destroyed by Hurricane Irma said:

“Look, you can never be 100 percent sure about links, But scientists have said the storms are going to get more and more and more intense and more and more often. We’ve had four storms within a month, all far greater than that have ever, ever, ever happened in history, Sadly, I think this is the start of things to come. Climate change is real. Ninety-nine percent of scientists know it’s real. The whole world knows it’s real except for maybe one person in the White House.”

May Boeve, executive director of the NGO 350.org, said “With a few exceptions, the major TV networks completely failed to cover the scientifically proven ways that climate change is intensifying extreme weather events like hurricanes Harvey and Irma. That’s not just disappointing, it’s dangerous. We won’t be able to turn this crisis around if our media is asleep at the wheel.”

Commenting on the destruction of Puerto Rico by Hurricane Maria, historian Juan Cole wrote: “When you vote for denialist politicians, you are selecting people who make policy. The policy they make will be clueless and will actively endanger the public. Climate change is real. We are causing it by our emissions. If you don’t believe that, you are not a responsible steward of our infrastructure and of our lives.”

When interviewed by Amy Goodman of *Democracy Now*, musician Stevie Wonder said:

“... we should begin to love and value our planet, and anyone who believes that there is no such thing as global warming must be blind or unintelligent.”

Another well-known musician, Beyoncé, added: “The effects of climate change are playing out around the world every day. Just this past week, we’ve seen devastation from the monsoon in India...and multiple catastrophic hurricanes. Irma alone has left a trail of death and destruction from the Caribbean to Florida to Southern United States. We have to be prepared for what comes next...”

In her September 2017 publication *Season of Smoke*<sup>1</sup>, prizewinning author Naomi Klein wrote:

“We hear about the record-setting amounts of water that Hurricane Harvey dumped on Houston and other Gulf cities and towns, mixing with petrochemicals to pollute and poison on an unfathomable scale. We hear too about the epic floods that have displaced hundreds of thousands of people from Bangladesh to Nigeria (though we don’t hear enough). And we are witnessing, yet again, the fearsome force of water and wind as Hurricane Irma, one of the most powerful storms ever recorded, leaves devastation behind in the Caribbean, with Florida now in its sights.

“Yet for large parts of North America, Europe, and Africa, this summer has not been about water at all. In fact it has been about its absence; it’s been about land so dry and heat so oppressive that forested mountains exploded into smoke like volcanoes. It’s been about fires fierce enough to jump the Columbia River; fast enough to light up the outskirts of Los Angeles like an invading army; and pervasive enough to threaten natural treasures, like the tallest and most ancient sequoia trees and Glacier National Park.

“For millions of people from California to Greenland, Oregon to Portugal, British Columbia to Montana, Siberia to South Africa, the summer of 2017 has been the summer of fire. And more than anything else, it’s been the summer of ubiquitous, inescapable smoke.

“For years, climate scientists have warned us that a warming world is an extreme world, in which humanity is buffeted by both brutalizing excesses and stifling absences of the core elements that have kept fragile life in equilibrium for millennia. At the end of the summer of 2017, with major cities submerged in water and others licked by flames, we are currently living through Exhibit A of this extreme world, one in which natural extremes come head-to-head with social, racial, and economic ones.”

It seems likely that the climate-linked disasters of 2019 and 2020 will be even more severe than those that we have witnessed during 2017 and 2018. But will such disasters be enough to wake us up?

The BBC has recently announced that Sir David Attenborough is currently producing a new series, *Blue Planet II*, which will focus on environmental issues.<sup>2</sup>

“My hope is that the world is coming to its senses ... I’m so old I remember a time when ... we didn’t talk about climate change, we talked about animals and species exter-

<sup>1</sup><https://theintercept.com/2017/09/09/in-a-summer-of-wildfires-and-hurricanes-my-son-asks-why-is-everything-going-wrong/>

<sup>2</sup><http://www.bbcearth.com/blueplanet2/>



Figure 14.5: Sir David Attenborough: “Disaster. It’s a terrible thing to say, isn’t it?”

mination,” Sir David told Greenpeace in an interview, “For the first time I’m beginning to think there is actually a groundswell, there is a change in the public view. I feel many more people are concerned and more aware of what the problems are. Young people - people who’ve got 50 years of their life ahead of them - they are thinking they ought to be doing something about this. That’s a huge change.”



Figure 14.6: Speaking at the opening ceremony of COP24, the universally loved and respected naturalist Sir David Attenborough said: “If we don’t take action, the collapse of our civilizations and the extinction of much of the natural world is on the horizon.”

## 14.4 Climate Change, The Facts

Now Sir David Attenborough has completed a new one-hour BBC program on the danger of catastrophic climate change. Here are some excerpts from an April 18 2019 review of the program by Rebecca Nicholson in *The Guardian*:

*The Facts* is a rousing call to arms. It is an alarm clock set at a horrifying volume. The first 40 minutes are given over to what Attenborough calls, without hyperbole, “our greatest threat in thousands of years”. Expert after expert explains the consequences of rising CO<sub>2</sub> levels, on the ice caps, on coastal regions, on weather and wildlife and society itself. The most powerful moments are in footage shot not by expert crews who have spent years on location, but on shaky cameras, capturing the very moment at which the reality of our warming planet struck the person holding the phone. In Cairns, Australia, flying foxes are unable to survive the extreme temperatures; rescuers survey the terrible massacre, and we learn that while 350 were saved, 11,000 died. A man and his son talk through their escape from raging wildfires, over the film they took while attempting to drive through a cavern of blazing red trees. These are horror movies playing out in miniature. It is difficult to watch even five minutes of this and remain somehow neutral, or unconvinced.

Yet as I kept on, scribbling down an increasingly grim list of statistics, most of which I knew, vaguely, though compiled like this they finally sound as dreadful as they truly are - 20 of the warmest years on record happened in the last 22 years; Greenland's ice sheet is melting five times faster than it was 25 years ago - I started to wonder about responsibility, and if and where it would be placed. This would be a toothless film, in the end, if it were hamstrung by political neutrality, and if its inevitable "it's not too late" message rested solely on individuals and what relatively little tweaks we might make as consumers. What about corporations? What about governments?

Then, at that exact moment, having played the despair through to its crescendo, the experts served up unvarnished honesty. They lined up to lay out the facts, plain and simple. Fossil fuel companies are the most profitable businesses man has ever known, and they engage in PR offensives, using the same consultants as tobacco companies, and the resulting uncertainty and denial, designed to safeguard profits, has narrowed our window for action. It is unforgivable. I find it hard to believe that anyone, regardless of political affiliation, can watch footage of Trump calling climate change "a hoax ... a money-making industry" and not be left winded by such staggering ignorance or astonishing deceit, though it is, more likely, more bleakly, a catastrophic combination of the two. At least Nigel Lawson only appears here in archive footage, and his argument sounds limp, to put it kindly.

Climate Change: The Facts should not have to change minds, but perhaps it will change them anyway, or at least make this seem as pressing as it needs to be. With the Extinction Rebellion protests across London this week, disrupting day-to-day business, and this, on primetime BBC One, maybe the message will filter through. At the very least, it should incite indignation that more was not done, sooner, and then urgency and a decision to both change and push for change at a much higher level. Because there is, for a brief moment, just possibly, still time.

## 14.5 Sir David testifies in Parliament

Referencing the rise of climate science denial in some countries while giving evidence to a committee of MPs in the UK, Attenborough said he was "sorry that there are people in power and internationally, notably the United States, but also in Australia".

Attenborough also said it would be "a very sad day" if President Donald Trump succeeded in withdrawing the US from the Paris Agreement, praising the UN process as an example of international cooperation.

He accused climate science deniers of cherry-picking their data, arguing it isn't proof to find a particular example of where glaciers had grown, rather than shrunk. "The proof is in the graphs, the proof is in the scientific records, the proof is in when you analyze bubbles from the sea ice and glacier ice to show you what has happened to the climate



Figure 14.7: Sir David Attenborough testifying at the British Parliament in July, 2019

over the years,” he added.

Asked if flights would have to become more expensive, to the point that normal families could no longer afford an annual holiday in France or Spain, he replied: “I don’t know how you would restrict air travel other than economically, so I am afraid that is the case, yes.”

He told the Business, Energy and Industrial Strategy Committee: “There’s a huge change in public perception. I suspect we are right now in the beginning of a big change.”

Sir David credited young people for bringing about the change, saying the electorate of tomorrow already understand the changes that need to be made.

### Some things that Sir David Attenborough has said

The future of life on earth depends on our ability to take action. Many individuals are doing what they can, but real success can only come if there’s a change in our societies and our economics and in our politics. I’ve been lucky in my lifetime to see some of the greatest spectacles that the natural world has to offer. Surely we have a responsibility to leave for future generations a planet that is healthy, inhabitable by all species.

Three and a half million years separate the individual who left these footprints in the sands of Africa from the one who left them on the moon. A mere blink in the eye of evolution. Using his burgeoning intelligence, this

most successful of all mammals has exploited the environment to produce food for an ever-increasing population. In spite of disasters when civilizations have over-reached themselves, that process has continued, indeed accelerated, even today. Now mankind is looking for food, not just on this planet but on others. Perhaps the time has now come to put that process into reverse. Instead of controlling the environment for the benefit of the population, perhaps it's time we control the population to allow the survival of the environment.

The growth in human numbers is frightening. I've seen wildlife under mounting human pressure all over the world, and it's not just from human economy or technology. Behind every threat is the frightening explosion in human numbers. I've never seen a problem that wouldn't be easier to solve with fewer people - or harder, and ultimately impossible, with more.

We cannot continue to deny the problem. People have pushed aside the question of population sustainability and not considered it because it is too awkward, embarrassing and difficult. But we have to talk about it.

We are a plague on the Earth. It's coming home to roost over the next 50 years or so. It's not just climate change; it's sheer space, places to grow food for this enormous horde. Either we limit our population growth or the natural world will do it for us, and the natural world is doing it for us right now.

### Suggestions for further reading

1. *David Attenborough's First Life: A Journey Back in Time with Matt Kaplan* Kindle Edition by Matt Kaplan
2. *Life on Earth: A Natural History* (Book Club Associates Edition) Hardcover - 1979 by Sir David Attenborough
3. *Discovering Life on Earth* Hardcover - 23 Nov 1981 by Sir David Attenborough
4. *Life Stories* ( 2009 ) Hardcover by Sir David Attenborough.
5. *The Trials of Life: A Natural History of Animal Behaviour* by David Attenborough (4-Oct-1990) Hardcover
6. By Sir David Attenborough - *The Living Planet (New edition)* Paperback - 25 Mar 1992



# Chapter 15

## AL GORE

### 15.1 An Inconvenient Truth

Albert Arnold Gore Jr. served as the 45th Vice President of the United States from January 1985 to January 1993. He then ran for the office of President, but was defeated by George W. Bush in a controversial election whose outcome was finally decided by the US Supreme Court<sup>1</sup>.

Al Gore is the founder and current Chairman of the Alliance for Climate Protection. He was one of the first important political figures to call attention to the problem of steadily increasing CO<sub>2</sub> levels in the atmosphere and the threat of catastrophic climate change. He produced the highly influential documentary film *An Inconvenient Truth*<sup>2</sup>. Because of his important efforts to save the global environment, Al Gore shared the 2007 Nobel Peace Prize with the Intergovernmental Panel on Climate Change.

### Excerpts from Al Gore's Nobel Lecture

...The distinguished scientists with whom it is the greatest honor of my life to share this award have laid before us a choice between two different futures - a choice that to my ears echoes the words of an ancient prophet: "Life or death, blessings or curses. Therefore, choose life, that both thou and thy seed may live."

We, the human species, are confronting a planetary emergency - a threat to the survival of our civilization that is gathering ominous and destructive potential even as we gather here. But there is hopeful news as well: we have the ability to solve this crisis and avoid the worst - though not all - of its consequences, if we act boldly, decisively and quickly.

However, despite a growing number of honorable exceptions, too many of the world's leaders are still best described in the words Winston Churchill

---

<sup>1</sup>Many people believe that Al Gore won the election.

<sup>2</sup><https://www.youtube.com/watch?v=I-SV13UQXdk>

applied to those who ignored Adolf Hitler's threat: "They go on in strange paradox, decided only to be undecided, resolved to be irresolute, adamant for drift, solid for fluidity, all powerful to be impotent."

So today, we dumped another 70 million tons of global-warming pollution into the thin shell of atmosphere surrounding our planet, as if it were an open sewer. And tomorrow, we will dump a slightly larger amount, with the cumulative concentrations now trapping more and more heat from the sun.

As a result, the earth has a fever. And the fever is rising. The experts have told us it is not a passing affliction that will heal by itself. We asked for a second opinion. And a third. And a fourth. And the consistent conclusion, restated with increasing alarm, is that something basic is wrong.

We are what is wrong, and we must make it right...

In the last few months, it has been harder and harder to misinterpret the signs that our world is spinning out of kilter. Major cities in North and South America, Asia and Australia are nearly out of water due to massive droughts and melting glaciers. Desperate farmers are losing their livelihoods. Peoples in the frozen Arctic and on low-lying Pacific islands are planning evacuations of places they have long called home. Unprecedented wildfires have forced a half million people from their homes in one country and caused a national emergency that almost brought down the government in another. Climate refugees have migrated into areas already inhabited by people with different cultures, religions, and traditions, increasing the potential for conflict. Stronger storms in the Pacific and Atlantic have threatened whole cities. Millions have been displaced by massive flooding in South Asia, Mexico, and 18 countries in Africa. As temperature extremes have increased, tens of thousands have lost their lives. We are recklessly burning and clearing our forests and driving more and more species into extinction. The very web of life on which we depend is being ripped and frayed.

We never intended to cause all this destruction, just as Alfred Nobel never intended that dynamite be used for waging war. He had hoped his invention would promote human progress. We shared that same worthy goal when we began burning massive quantities of coal, then oil and methane.

Even in Nobel's time, there were a few warnings of the likely consequences. One of the very first winners of the Prize in chemistry worried that, "We are evaporating our coal mines into the air." After performing 10,000 equations by hand, Svante Arrhenius calculated that the earth's average temperature would increase by many degrees if we doubled the amount of CO<sub>2</sub> in the atmosphere.

Seventy years later, my teacher, Roger Revelle, and his colleague, Dave Keeling, began to precisely document the increasing CO<sub>2</sub> levels day by day.

But unlike most other forms of pollution, CO<sub>2</sub> is invisible, tasteless, and odorless - which has helped keep the truth about what it is doing to our climate out of sight and out of mind. Moreover, the catastrophe now threatening us is unprecedented - and we often confuse the unprecedented with the improbable.

We also find it hard to imagine making the massive changes that are now necessary to solve the crisis. And when large truths are genuinely inconvenient, whole societies can, at least for a time, ignore them. Yet as George Orwell reminds us: “Sooner or later a false belief bumps up against solid reality, usually on a battlefield.”...

We must quickly mobilize our civilization with the urgency and resolve that has previously been seen only when nations mobilized for war. These prior struggles for survival were won when leaders found words at the 11th hour that released a mighty surge of courage, hope and readiness to sacrifice for a protracted and mortal challenge.

These were not comforting and misleading assurances that the threat was not real or imminent; that it would affect others but not ourselves; that ordinary life might be lived even in the presence of extraordinary threat; that Providence could be trusted to do for us what we would not do for ourselves.

No, these were calls to come to the defense of the common future. They were calls upon the courage, generosity and strength of entire peoples, citizens of every class and condition who were ready to stand against the threat once asked to do so. Our enemies in those times calculated that free people would not rise to the challenge; they were, of course, catastrophically wrong.

Now comes the threat of climate crisis - a threat that is real, rising, imminent, and universal. Once again, it is the 11th hour. The penalties for ignoring this challenge are immense and growing, and at some near point would be unsustainable and unrecoverable. For now we still have the power to choose our fate, and the remaining question is only this: Have we the will to act vigorously and in time, or will we remain imprisoned by a dangerous illusion?

### Al Gore’s TED talk: The Case for Optimism on Climate Change

In 2016, Al Gore gave an important talk to a TED audience<sup>3</sup>. in which he pointed out the an economic tipping point has just been passed. Solar energy and wind energy are now cheaper than energy form fossil fuels. This means that economic forces alone can drive a rapid transition to 100% renewable energy. Investors will realize that renewables represent an unparalleled investment opportunity.

## 15.2 Climate change denial in the mass media

The Wikipedia article on climate change denial describes it with the following words: “Although scientific opinion on climate change is that human activity is extremely likely to be the primary driver of climate change, the politics of global warming have been affected by climate change denial, hindering efforts to prevent climate change and adapt

---

<sup>3</sup><https://www.youtube.com/watch?v=I-SV13UQXdk>



Figure 15.1: Network administrators have noticed that programs about climate change often have low viewer ratings. Since they see delivering high viewer ratings to their advertisers as their primary duty, these executives seldom allow programs dealing with the danger of catastrophic climate change. The duty to save the earth from environmental catastrophe is neglected for the sake of money. As Al Gore said, “Instead of having a well-informed electorate, we have a well-amused audience”.

to the warming climate. Those promoting denial commonly use rhetorical tactics to give the appearance of a scientific controversy where there is none.”

It is not surprising that the fossil fuel industry supports, on a vast scale, politicians and mass media that deny the reality of climate change. The amounts of money at stake are vast. If catastrophic climate change is to be avoided, coal, oil and natural gas “assets” worth trillions of dollars must be left in the ground. Giant fossil fuel corporations are desperately attempting to turn these “assets” into cash.

## Preventing an ecological apocalypse

Here are some excerpts from an article entitled *Only Rebellion will prevent an ecological apocalypse* by George Monbiot, which was published on April 15 2019 in The Guardian<sup>4</sup>:

---

<sup>4</sup><https://www.theguardian.com/commentisfree/2019/apr/15/rebellion-prevent-ecological-apocalypse-civil-disobedience>



No one is coming to save us. Mass civil disobedience is essential to force a political response.

Had we put as much effort into preventing environmental catastrophe as we've spent on making excuses for inaction, we would have solved it by now. Everywhere I look, I see people engaged in furious attempts to fend off the moral challenge it presents...

As the environmental crisis accelerates, and as protest movements like YouthStrike4Climate and Extinction Rebellion make it harder not to see what we face, people discover more inventive means of shutting their eyes and shedding responsibility. Underlying these excuses is a deep-rooted belief that if we really are in trouble, someone somewhere will come to our rescue: "they" won't let it happen. But there is no they, just us.

The political class, as anyone who has followed its progress over the past three years can surely now see, is chaotic, unwilling and, in isolation, strategically incapable of addressing even short-term crises, let alone a vast existential predicament. Yet a widespread and wilful naivety prevails: the belief that voting is the only political action required to change a system. Unless it is accompanied by the concentrated power of protest - articulating precise demands and creating space in which new political factions can grow - voting, while essential, remains a blunt and feeble instrument.

The media, with a few exceptions, is actively hostile. Even when broadcasters cover these issues, they carefully avoid any mention of power, talking about environmental collapse as if it is driven by mysterious, passive forces, and proposing microscopic fixes for vast structural problems. The BBC's Blue Planet Live series exemplified this tendency.

Those who govern the nation and shape public discourse cannot be trusted

with the preservation of life on Earth. There is no benign authority preserving us from harm. No one is coming to save us. None of us can justifiably avoid the call to come together to save ourselves...

## Predatory delay

Here are some excerpts from a May 3 2019 article by Bill Henderson entitled *Neoliberalism, Solution Aversion, Implicatory Denial and Predatory Delay*<sup>5</sup>:

Looking back at the history, that it's not really a failure of human beings and human nature that's the problem here. It's a hijacking of our political and economic system by the fossil fuel industry and a small number of like-minded people. It was our bad luck that this idea that markets solve all problems and that government should be left to wither away crested just at the moment when it could do the most damage.

Despite the urgent need to reduce greenhouse gas emissions globally if we are to lower the risks of catastrophic climate change, wealthy industrialized nations persist with a widespread public silence on the issue and fail to address climate change. This is despite there being ever more conclusive evidence of its severity. Why is there an undercurrent of inaction, despite the challenge of climate change being ever more daunting? One element is denial.

George Marshall discovered that there has not been a single proposal, debate or even position paper on limiting fossil fuel production put forward during international climate negotiations. From the very outset fossil fuel production lay outside the frame of the discussions and, as with other forms of socially constructed silence, the social norms among the negotiators and policy specialists kept it that way.

Global climate leadership is being redefined. There is a growing recognition that you cannot be a climate leader if you continue to enable new fossil fuel production, which is inconsistent with climate limits. If no major producers step up to stop the expansion of extraction and begin phasing out existing fields and mines, the Paris goals will become increasingly difficult to achieve. Wealthy fossil fuel producers have a responsibility to lead, and this must include planning for a just and equitable managed decline of existing production.

The (emissions reduction) curve we've been forced onto bends so steeply, that the pace of victory is part of victory itself. Winning slowly is basically the same thing as losing outright. We cannot afford to pursue past strategies, aimed at limited gains towards distant goals. In the face of both triumphant denialism and predatory delay, trying to achieve climate action by doing the same things, the same old ways, means defeat. It guarantees defeat.

---

<sup>5</sup><https://countercurrents.org/2019/05/03/neoliberalism-solution-aversion-implicatory-denial-and-predatory-delay-bill-henderson/>

A fast, emergency-scale transition to a post-fossil fuel world is absolutely necessary to address climate change. But this is excluded from consideration by policymakers because it is considered to be too disruptive. The orthodoxy is that there is time for an orderly economic transition within the current short-termist political paradigm. Discussion of what would be safe - less warming than we presently experience - is non-existent. And so we have a policy failure of epic proportions. Policymakers, in their magical thinking, imagine a mitigation path of gradual change, to be constructed over many decades in a growing, prosperous world...

### 15.3 Showing unsustainable lifestyles in the mass media

Television and other mass media contribute indirectly to climate change denial by showing unsustainable lifestyles. Television dramas show the ubiquitous use of gasoline-powered automobiles and highways crowded with them. Just as though there did not exist an urgent need to transform our transportation systems. Motor racing is shown. A program called “Top Gear” tells viewers about the desirability of various automobiles. In general, cyclists are not shown. In television dramas, the protagonists fly to various parts of the world for their holidays. The need for small local self-sustaining communities is not shown.

Advertisements in the mass media urge us to consume more, to fly, to purchase large houses, and to buy gasoline-driven automobiles, just as though such behavior ought to be the norm. Such norms are leading us towards environmental disaster.

### 15.4 Alternative media

Luckily, the mass media do not have a complete monopoly on public information. With a little effort, citizens who are concerned about the future can find alternative media. These include a large number of independent on-line news services that are supported by subscriber donations rather than by corporate sponsors. *YouTube* videos also represent an extremely important source of public information.



### Suggestions for further reading

1. Abarbanel A, McClusky T (1950) *Is the world getting warmer?* Saturday Evening Post, 1 Jul, p22
2. Bagdikian BH (2004) *The New Media Monopoly*. Boston, MA, USA: Beacon
3. Bennett WL (2002) *News: The Politics of Illusion*, 5th edition. New York, NY, USA: Longman
4. Boykoff MT, Boykoff JM (2004) *Balance as bias: global warming and the US prestige press*. Glob Environ Change **14**: 125-136
5. Boykoff MT, Boykoff JM (2007) *Climate change and journalistic norms: A case study of U.S. mass-media coverage*. Geoforum (in press)
6. Carey JW (1989) *Communication as Culture: Essays on Media and Society*. Boston, MA, USA: Unwin Hyman
7. Carvalho A (2005) *Representing the politics of the greenhouse effect: Discursive strategies in the British media*. Critical Discourse Studies **2**: 1-29
8. CEI (2006) *We Call it Life*. Washington, DC, USA: Competitive Enterprise Institute
9. Cowen RC (1957) *Are men changing the earth's weather?* Christian Science Monitor, 4 Dec, p13
10. Cushman JH (1998) *Industrial group plans to battle climate treaty*. New York Times, 26 Apr, p1
11. Doyle G (2002) *Media Ownership: The Economics and Politics of Convergence and Concentration in the UK and European Media*. London, UK: Sage Publications
12. Dunwoody S, Peters HP (1992) *Mass media coverage of technological and environmental risks: A survey of research in the United States and Germany*. Public Underst Sci **1**: 199-230

13. Entman RM (1993) *Framing: toward clarification of a fractured paradigm*. J Commun **43**: 51-58
14. Fleming JR (1998) *Historical Perspectives on Climate Change*. Oxford, UK: Oxford University Press
15. Gelbspan R (1998) *The Heat Is On*. Cambridge, MA, USA: Perseus Books
16. Grove RH (2003) *Green Imperialism*. Cambridge, UK: Cambridge University Press
17. Leggett J (2001) *The Carbon War*. New York, NY, USA: Routledge
18. McChesney RW (1999) *Rich Media, Poor Democracy: Communication Politics in Dubious Times*. Urbana, IL, USA: University of Illinois Press
19. McComas K, Shanahan J (1999) *Telling stories about global climate change: Measuring the impact of narratives on issue cycles*. Commun Res **26**: 30-57
20. McCright AM (2007) *Dealing with climate change contrarians*. In Moser SC, Dilling L (eds) **Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change**, pp 200-212. Cambridge, UK: Cambridge University Press
21. McCright AM, Dunlap RE (2000) *Challenging global warming as a social problem: An analysis of the conservative movement's counter-claims*. Soc Probl **47**: 499-522
22. McCright AM, Dunlap RE (2003) *Defeating Kyoto: The conservative movement's impact on U.S. climate change policy*. Soc Probl **50**: 348-373
23. Mooney C (2004) *Blinded by science*. Columbia Journalism Review 6(Nov/Dec), [www.cjr.org](http://www.cjr.org)
24. NSF (2004) Science and Engineering Indicators 2004. Washington, DC, USA: National Science Foundation Project for Excellence in Journalism (2006) *The State of the News Media 2006*. Washington, DC, USA:
25. Project for Excellence in Journalism. [www.stateofthenewsmedia.org](http://www.stateofthenewsmedia.org) Rajan SR (2006) *Modernizing Nature*. Oxford, UK: Oxford University Press
26. Sandell C, Blakemore B (2006) *ABC News reporting cited as evidence in congressional hearing on global warming*. ABC News, 27 Jul, <http://abcnews.go.com>
27. Shabecoff P (1988) *Global warming has begun, expert tells senate*. New York Times, 24 Jun, pA1
28. Shrader-Frechette KS (1993) *Burying Uncertainty*. Berkeley, CA, USA: University of California Press
29. Starr P (2004) *The Creation of the Media: Political Origins of Modern Communications*. New York, NY, USA: Basic Books
30. Ungar S (1992) *The rise and (relative) decline of global warming as a social problem*. Sociol Q **33**: 483-501
31. Weart SR (2003) *The Discovery of Global Warming*. Cambridge, MA, USA: Harvard University Press
32. Weingart P, Engels A, Pansegrau P (2000) *Risks of communication: Discourses on climate change in science, politics, and the mass media*. Public Underst Sci **9**: 261-283
33. Wilkins L (1993) *Between the facts and values: Print media coverage of the greenhouse effect, 1987-1990*. Public Underst Sci **2**: 71-84

34. Wilson KM (1995) *Mass media as sources of global warming knowledge*. Mass Communication Review **22**: 75-89
35. Wilson KM (2000) *Communicating climate change through the media: Predictions, politics, and perceptions of risks*. In Allan S, Adam B, Carter C (eds) **Environmental Risks and the Media**, pp 201-217. New York, NY, USA: Routledge
36. Zehr SC (2000) *Public representations of scientific uncertainty about global climate change*. Public Underst Sci **9**: 85-103
37. O.N. Larsen, ed., *Violence and the Mass Media*, Harper and Row, (1968).
38. R.M. Liebert et al., *The Early Window: The Effects of Television on Children and Youth*, Pergamon, Elmsford, NY, (1982).
39. G. Noble, *Children in Front of the Small Screen*, Constable, London, (1975).
40. H.J. Schneider, *Das Geschäft mit dem Verbrechen. Massenmedien und Kriminalität*, Kindler, Munich, (1980).
41. W. Schramm, ed., *Grundfragen der Kommunikationsforschung*, Munich, (1973).
42. J.L. Singer and D.G. Singer, *Television, Imagination and Aggression: A Study of Preschoolers*, Erlbaum, Hillsdale, NY, (1981).
43. O.N. Larsen, ed., *Violence and the Mass Media*, Harper and Row, (1968).
44. H.J. Skornia, *Television and Society*, McGraw-Hill, New York, (1965).
45. D.L. Bridgeman, ed., *The Nature of Prosocial Behavior*, New York, Academic Press, (1983).
46. N. Eisenberg, ed., *The Development of Prosocial Behavior*, New York, Academic Press, (1982).
47. W.H. Goodenough, *Cooperation and Change: An Anthropological Approach to Community Development*, New York, Russell Sage Foundation, (1963).
48. J.R. Macauley and L. Berkowitz, *Altruism and Helping Behavior*, Academic Press, New York, (1970).
49. P. Mussen and N. Eisenberg, *Roots of Caring, Sharing and Helping*, Freeman, San Francisco, (1977).
50. J.P. Rushton and R.M. Sorrentino, eds., *Altruism and Helping Behavior*, Erlbaum, Hillsdale, NJ, (1981).
51. L. Wispé, ed, *Altruism, Sympathy and Helping*, Academic Press, New York, (1978).
52. J.-C. Guedon, *La Planète Cyber, Internet et Cyberspace*, Gallimard, (1996).
53. J. Segal, *Théorie de l'information: sciences, techniques et société, de la seconde guerre mondiale à l'aube du XXI siècle*, Thèse de Doctorat, Université Lumière Lyon II, (1998), (<http://www.mpiwg-berlin.mpg.de/staff/segal/thesis/>)
54. H. von Foerster, editor, *Cybernetics - circular, causal and feed-back mechanisms in biological and social systems*. Transactions of sixteenth conferences, Josiah J. Macy Jr. Foundation, New York, (1950- 1954).
55. G. Bateson, *Communication, the Social Matrix of Psychiatry*, Norton, (1951).
56. G. Bateson, *Steps to an Ecology of Mind*, Chandler, San Francisco, (1972).
57. G. Bateson, *Communication et Société*, Seuil, Paris, (1988).
58. R.M. Liebert et al., *The Early Window: The Effects of Television on Children and Youth*, Pergamon, Elmsford, NY, (1982).

59. G. Noble, *Children in Front of the Small Screen*, Constable, London, (1975).
60. J.L. Singer and D.G. Singer, *Television, Imagination and Aggression: A Study of Preschoolers*, Erlbaum, Hillsdale, NY, (1981).



# Chapter 16

## GRETA THUNBERG

### 16.1 Greta Thunberg's TED talk

Greta Thunberg was born in Sweden in 2003. Her father, Svante Thunberg, is related to Svante Arrhenius, one of the important pioneers of climate science, and is named after him. Greta's mother was a successful opera singer. Greta Thunberg's strong belief in the urgency of action to prevent catastrophic climate change converted her parents, so that they made changes in their lives. For example, Greta's mother gave up her career as an opera singer because it involved air travel.

In November, 2018, Greta Thunberg gave an impressively clear TEDx talk in Stockholm, the video of which was recently released.<sup>1</sup> Here is a transcript of the talk.

When I was about 8 years old, I first heard about something called 'climate change' or 'global warming'. Apparently, that was something humans had created by our way of living. I was told to turn off the lights to save energy and to recycle paper to save resources. I remember thinking that it was very strange that humans, who are an animal species among others, could be capable of changing the Earth's climate. Because, if we were, and if it was really happening, we wouldn't be talking about anything else. As soon as you turn on the TV, everything would be about that. Headlines, radio, newspapers: You would never read or hear about anything else. As if there was a world war going on, but no one ever talked about it. If burning fossil fuels was so bad that it threatened our very existence, how could we just continue like before? Why were there no restrictions? Why wasn't it made illegal?

To me, that did not add up. It was too unreal.

So, when I was 11, I became ill, I fell into depression, I stopped talking, and I stopped eating. In two months, I lost about 10 kilos of weight. Later on, I was diagnosed with Asperger's syndrome, OCD and selective mutism. This

---

<sup>1</sup><https://www.dailykos.com/stories/2018/12/16/1819508/-A-Call-to-Action-on-Climate-Change-by-15-year-Old-Greta-Thunberg>

basically means, I only speak, when I think it is necessary.

Now is one of those moments.

For those of us, who are on the spectrum, almost everything is black or white. We aren't very good at lying and we usually don't enjoy participating in the social games that the rest of you seem so fond of. I think, in many ways, that we autistic are the normal ones and the rest of the people are pretty strange. Especially when it comes to the sustainability crisis: Where everyone keeps saying that climate change is an existential threat and the most important issue of all. And yet, they just carry on like before.

I don't understand that. Because if the emissions have to stop, then we must stop the emissions. To me, that is black or white. There are no gray areas when it comes to survival. Either we go on as a civilization or we don't.

We have to change.

Rich countries like Sweden need to start reducing emissions by at least 15% every year. And that is so that we can stay below a 2 degrees warming target. Yet, as the IPCC has recently demonstrated, aiming instead for 1.5 degrees Celsius would significantly reduce the climate impacts. But we can only imagine what that means for reducing emissions.

You would think the media and every one of our leaders would be talking about nothing else. But they never even mention it.

Nor does anyone ever mentioned the greenhouse gases already locked in the system. Nor that air pollution is hiding some warming; so that, when we stop burning fossil fuels, we already have an extra level of warming - perhaps as high as 0.5 to 1.1 degrees Celsius.

Furthermore, does hardly anyone speak about the fact that we are in the midst of the sixth mass extinction: With up to 200 species going extinct every single day. That the extinction rate is today between 1000 and 10,000 times higher than what is seen as normal.

Nor does hardly anyone ever speak about the aspect of equity or climate justice, clearly stated everywhere in the Paris agreement, which is absolutely necessary to make it work on a global scale. That means that rich countries need to get down to zero emissions within 6 to 12 years with today's emission speed. And that is so that people in poorer countries can have a chance to heighten their standard of living by building some of the infrastructures that we have already built, such as roads, schools, hospitals, clean drinking water, electricity, and so on. Because, how can we expect countries like India or Nigeria to care about the climate crisis if we, who already have everything, don't care even a second about it or our actual commitments to the Paris agreement?

So why are we not reducing our emissions? Why are they in fact still increasing? Are we knowingly causing a mass extinction? Are we evil?

No, of course, not. People keep doing what they do because the vast majority doesn't have a clue about the actual consequences for their everyday life.

And they don't know that rapid change is required.

We all think we know and we all think everybody knows. But we don't.

Because, how could we? If there really was a crisis, and if this crisis was caused by our emissions, you would at least see some signs. Not just flooded cities. Tens of thousands of dead people and whole nations leveled to piles of torn down buildings. You would see some restrictions.

But no. And no one talks about it. There are no emergency meetings, no headlines, no breaking news. No one is acting as if we were in a crisis.

Even most climate scientists or green politicians keep on flying around the world, eating meat and dairy.

If I live to be 100, I will be alive in the year 2103. When you think about the future today, you don't think beyond the year 2050. By then I will, in the best case, not even have lived half of my life. What happens next? In the year 2078, I will celebrate my 75th birthday. If I have children or grandchildren, maybe they will spend that day with me. Maybe they will ask me about you, the people who were around back in 2018. Maybe they will ask why you didn't do anything while there still was time to act. What we do or don't do right now, will affect my entire life and the lives of my children and grandchildren. What we do or don't do right now, me and my generation can't undo in the future.

So, when school started in August of this year, I decided that this was enough. I set myself down on the ground outside the Swedish parliament. I school-striking for the climate.

Some people say that I should be in school instead. Some people say that I should study, to become a climate scientist so that I can solve the climate crisis.

But the climate crisis has already been solved. We already have all the facts and solutions. All we have to do is to wake up and change.

And why should I be studying for a future that soon will be no more, when no one is doing anything whatsoever to save that future? And what is the point of learning facts in the school system, when the most important facts given by the finest science of that same school system clearly means nothing to our politicians and our society?

Some people say that Sweden is just a small country and that it doesn't matter what we do. But I think that if a few children can get headlines all over the world just by not coming to school for a few weeks, imagine what we could all do together if we wanted to?

Now we're almost at the end of my talk and this is where people usually people usually start talking about hope. Solar panels, wind power, circular economy, and so on. But I'm not going to do that. We've had 30 years of pep talking and selling positive ideas. And I'm sorry but it doesn't work because if it would have, the emissions would have gone down by now. They haven't.

And yes, we do need hope. Of course, we do. But the one thing we need

more than hope is action. Once we start to act, hope is everywhere. So instead of looking for hope, look for action. Then and only then, hope will come today.

Today we use 100 million barrels of oil every single day. There are no politics to change that. There are no rules to keep that oil in the ground. So, we can't save the world by playing by the rules, because the rules have to be changed.

Everything needs to change and it has to start today.

Thank you.

## 16.2 Only immediate climate action can save the future

Immediate action to halt the extraction of fossil fuels and greatly reduce the emission of CO<sub>2</sub> and other greenhouse gasses is needed to save the long-term future of human civilization and the biosphere.

At the opening ceremony of United Nations-sponsored climate talks in Katowice, Poland, Sir David Attenborough said "Right now, we are facing a man-made disaster of global scale. Our greatest threat in thousands of years. Climate change. If we don't take action, the collapse of our civilizations and the extinction of much of the natural world is on the horizon. The world's people have spoken. Their message is clear. Time is running out. They want you, the decision-makers, to act now."

Antonio Guterres, UN Secretary-General, said climate change was already "a matter of life and death" for many countries. He added that the world is "nowhere near where it needs to be" on the transition to a low-carbon economy.

Swedish student Greta Thunberg, is a 16-year-old who has launched a climate protest movement in her country. She said, in a short but very clear speech after that of UN leader Antonio Guterres: "Some people say that I should be in school instead. Some people say that I should study to become a climate scientist so that I can 'solve the climate crisis'. But the climate crisis has already been solved. We already have all the facts and solutions."

She added: "Why should I be studying for a future that soon may be no more, when no one is doing anything to save that future? And what is the point of learning facts when the most important facts clearly mean nothing to our society?"

Thunberg continued: "Today we use 100 million barrels of oil every single day. There are no politics to change that. There are no rules to keep that oil in the ground. So we can't save the world by playing by the rules. Because the rules have to be changed."

She concluded by saying that "since our leaders are behaving like children, we will have to take the responsibility they should have taken long ago."

Appearing among billionaires, corporate CEO's and heads of state at the Davos Economic Forum in Switzerland, like a new Joan of Arc, 16-year-old Swedish climate activist Greta Thunberg called on decision-makers to fulfil their responsibilities towards future generations. Here are some excerpts from her speech:

### Greta's speech at Davos

Our house is on fire. I am here to say, our house is on fire. According to the IPCC, we are less than 12 years away from not being able to undo our mistakes. In that time, unprecedented changes in all aspects of society need to have taken place, including a reduction of our CO<sub>2</sub> emissions by at least 50%...

Here in Davos - just like everywhere else - everyone is talking about money. It seems money and growth are our only main concerns.

And since the climate crisis has never once been treated as a crisis, people are simply not aware of the full consequences on our everyday life. People are not aware that there is such a thing as a carbon budget, and just how incredibly small that remaining carbon budget is. That needs to change today.

No other current challenge can match the importance of establishing a wide, public awareness and understanding of our rapidly disappearing carbon budget, that should and must become our new global currency and the very heart of our future and present economics.

We are at a time in history where everyone with any insight of the climate crisis that threatens our civilization - and the entire biosphere - must speak out in clear language, no matter how uncomfortable and unprofitable that may be.

We must change almost everything in our current societies. The bigger your carbon footprint, the bigger your moral duty. The bigger your platform, the bigger your responsibility.





Figure 16.1: Greta Thunberg on the cover of Time Magazine, The Intergovernmental Panel on Climate Change, in their October 2018 report, used strong enough language to wake up at least part of the public: the children whose future is at stake. Here is an excerpt from a speech which 16-year-old Swedish climate activist Greta Thunberg made at the Davos Economic Forum in January, 2019: “Our house is on fire. I am here to say, our house is on fire. According to the IPCC, we are less than 12 years away from not being able to undo our mistakes. In that time, unprecedented changes in all aspects of society need to have taken place, including a reduction of our CO<sub>2</sub> emissions by at least 50%...”

## 16.3 Worldwide school strike, 15 March, 2019

Over 1.4 million young students across all continents took to the streets on Friday March 15th for the first ever global climate strike. Messages in more than 40 languages were loud and clear: world leaders must act now to address the climate crisis and save our future. The school strike was the largest climate action in history. Nevertheless it went almost unmentioned in the media,

Here are some of the statements by the students explaining why they took part in the strikes:

**In India, no one talks about climate change. You don't see it on the news or in the papers or hear about it from government. We want global leaders to declare a climate emergency. If we don't act today, then we will have no tomorrow.** - Vidit Baya, 17, Udaipur, India.

**We face heartbreaking loss due to increasingly extreme weather events. We urge the Taiwanese government to implement mitigation measures and face up to the vulnerability of indigenous people, halt construction projects in the indigenous traditional realm, and recognize the legal status of Plains Indigenous People, in order to implement environmental protection as a bottom-up approach** - Kaisanan Ahuan, Puli City, Taiwan.

**We have reached a point in history when we have the technical capacities to solve poverty, malnutrition, inequality and of course global warming. The deciding factors for whether we take advantage of our potential will be our activism, our international unity and our ability to develop the art of making the impossible possible. Whether we succeed or not depends on our political will** - Eyal Weintraub, 18, and Bruno Rodriguez, 18, Argentina.

**The damage done by multinationals is enormous: the lack of transparency, dubious contracts, the weakening of the soil, the destruction of flora and fauna, the lack of respect for mining codes, the contamination of groundwater. In Mali, the state exercises insufficient control over the practices of the multinationals, and it is us, the citizens, who suffer the consequences. The climate alarm has sounded, and the time has come for us all to realize that there is still time to act locally, in our homes, our villages, our cities** - Mone Fousseny, 22, Mali.

2

---

<sup>2</sup><https://www.theguardian.com/environment/2019/apr/03/parents-around-the-world-mobilise-behind-youth-climate-strikes>

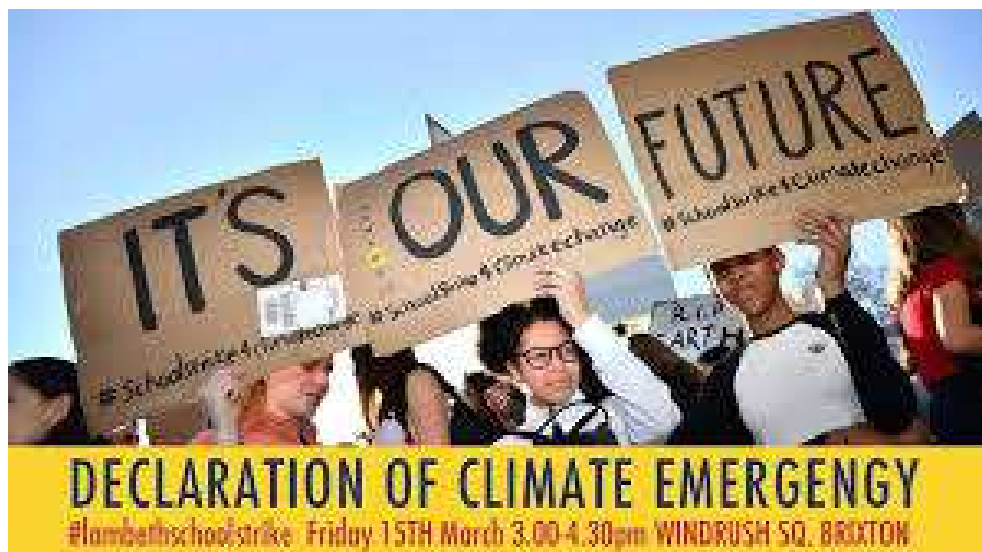






Figure 16.2: Eve White and her children join climate protesters in Tasmania. According to an article in *The Guardian*, parents and grandparents around the world are mobilizing in support of the youth climate movement that has swept the globe.

## Concerns of young protesters are justified

In an article in the journal *Science* dated 12 April, 2019,<sup>3</sup> 20 prominent climate scientists stated that the concerns of student protesters around the world are fully justified. Here are some quotations from the article:

The world's youth have begun to persistently demonstrate for the protection of the climate and other foundations of human well-being. As scientists and scholars who have recently initiated similar letters of support in our countries, we call for our colleagues across all disciplines and from the entire world to support these young climate protesters. We declare: Their concerns are justified and supported by the best available science. The current measures for protecting the climate and biosphere are deeply inadequate.

Nearly every country has signed and ratified the Paris Agreement of 2015, committing under international law to hold global warming well below 2°C above preindustrial levels and to pursue efforts to limit the temperature increase to 1.5°C. The scientific community has clearly concluded that a global warming of 2°C instead of 1.5°C would substantially increase climate-related impacts and the risk of some becoming irreversible. Moreover, given the uneven distribution of most impacts, 2°C of warming would further exacerbate existing global inequalities.

It is critical to immediately begin a rapid reduction in CO<sub>2</sub> and other greenhouse gas emissions. The degree of climate crisis that humanity will experience in the future will be determined by our cumulative emissions; rapid reduction now will limit the damage. For example, the Intergovernmental Panel on Climate Change (IPCC) has recently assessed that halving CO<sub>2</sub> emissions by 2030 (relative to 2010 levels) and globally achieving net-zero CO<sub>2</sub> emissions by 2050 (as well as strong reductions in other greenhouse gases) would allow a 50% chance of staying below 1.5°C of warming. Considering that industrialized countries produced more of and benefited more from previous emissions, they have an ethical responsibility to achieve this transition more quickly than the world as a whole.

Many social, technological, and nature-based solutions already exist. The young protesters rightfully demand that these solutions be used to achieve a sustainable society. Without bold and focused action, their future is in critical danger. There is no time to wait until they are in power...

The enormous grassroots mobilization of the youth climate movement - including Fridays for Future, School (or Youth) Strike 4 Climate, Youth for (or 4) Climate, and Youth Climate Strike - shows that young people understand the situation. We approve and support their demand for rapid and forceful action. We see it as our social, ethical, and scholarly responsibility to state in no uncertain terms: Only if humanity acts quickly and resolutely can we limit

---

<sup>3</sup><https://science.sciencemag.org/content/364/6436/139.2>



global warming, halt the ongoing mass extinction of animal and plant species, and preserve the natural basis for the food supply and well-being of present and future generations. This is what the young people want to achieve. They deserve our respect and full support.



Figure 16.3: Greta Thunberg addressing a meeting of the European Parliament in April, 2019. She complained that Brexit was treated as an emergency by the European Union, but climate change, which is a far greater emergency has been almost neglected. The 16-year-old, who is due to meet the Pope on Wednesday, said, “We face an end to civilization as we know it unless permanent changes take place in our society...European elections are coming soon and many like me who are affected most by this crisis, are not allowed to vote. That is why millions of children are taking to the street to draw attention to the climate crisis... It is not too late to act but it will take far-reaching vision and fierce determination... My plea is: Please wake up and do the seemingly impossible.”

## 16.4 The World Meteorological Organization's report

According to a recent United Nations report, extreme weather events displaced 2 million people during 2018. While no single event can be unambiguously attributed to anthropogenic climate change, scientists believe the increasing frequency of extreme weather events is definitely linked to global warming. The same is true of their increasing severity.

The report states that during 2018, extreme weather events impacted roughly 62 million people, of whom 2 million were displaced from their homes. In the words of the WMO report, "The physical signs and socio-economic impacts of climate change are accelerating, as record greenhouse gas concentrations drive global temperatures towards increasingly dangerous levels."

UN Secretary General Antonio Guterres, speaking at the launching of the WMO report, used the occasion to remind global leaders of the urgency of the climate emergency. Guterres has convened a climate summit meeting scheduled for September 23, 2019, and referring to the meeting, he said: "Don't come with a speech, come with a plan. This is what science says is needed. It is what young people around the globe are rightfully demanding." Two weeks previously, on March 15, one and a half million students from more than 130 countries had skipped school to participate in the largest climate demonstration in history, demanding action to save the future from the threat of catastrophic climate change.

## 16.5 Only 12 years left to limit climate change catastrophe

The world's leading scientists met at the Forty-Eighth Session of the IPCC and First Joint Session of Working Groups I, II, and III, 1-5 October 2018 in Incheon, Republic of Korea and openly declared that civilization is on track for collapse because of reckless use of fossil fuels, unless immediate action is taken to drastically cut the extraction and use of fossil fuels.

The report finds that limiting global warming to 1.5°C would require "rapid and far-reaching" transitions in land, energy, industry, buildings, transport, and cities. Global net human-caused emissions of carbon dioxide would need to fall by about 45 percent from 2010 levels by 2030, reaching 'net zero' around 2050.

"It's a line in the sand and what it says to our species is that this is the moment and we must act now," said Debra Roberts, a co-chair of the working group on impacts. "This is the largest clarion bell from the science community and I hope it mobilizes people and dents the mood of complacency."

"We have presented governments with pretty hard choices. We have pointed out the enormous benefits of keeping to 1.5C, and also the unprecedented shift in energy systems and transport that would be needed to achieve that," said Jim Skea, a co-chair of the working group on mitigation. "We show it can be done within laws of physics and chemistry.



Figure 16.4: A firefighter battles fire in California. The world is currently 1 degree Centigrade warmer than preindustrial levels.

Then the final tick box is political will. We cannot answer that. Only our audience can - and that is the governments that receive it.”

Bob Ward, of the Grantham Research Institute on Climate Change, said the final document was “incredibly conservative” because it did not mention the likely rise in climate-driven refugees or the danger of tipping points that could push the world on to an irreversible path of extreme warming.

Policymakers commissioned the report at the Paris climate talks in 2016, but since then the gap between science and politics has widened. Donald Trump has promised to withdraw the US - the world’s biggest source of historical emissions - from the accord. Brazil’s president, Jair Bolsonaro, threatens to do the same and also open the Amazon rainforest to agribusiness.

## 16.6 COP24, the climate summit in Poland

### The UN Secretary General’s address to the opening session

Welcome to COP 24.

I thank President Duda, Minister Kowalczyk and COP President Designate Mijal Kurtyka for their warm welcome.

We are in trouble. We are in deep trouble with climate change.

Climate change is running faster than we are and we must catch up sooner rather than later before it is too late.

For many, people, regions even countries this is already a matter of life and death.

This meeting is the most important gathering on climate change since the Paris Agreement was signed.



Figure 16.5: UN Secretary-General Antonio Guterres: “It is hard to overstate the urgency of our situation. Even as we witness devastating climate impacts causing havoc across the world, we are still not doing enough, nor moving fast enough, to prevent irreversible and catastrophic climate disruption. Nor are we doing enough to capitalize on the enormous social, economic and environmental opportunities of climate action.”

It is hard to overstate the urgency of our situation.

Even as we witness devastating climate impacts causing havoc across the world, we are still not doing enough, nor moving fast enough, to prevent irreversible and catastrophic climate disruption.

Nor are we doing enough to capitalize on the enormous social, economic and environmental opportunities of climate action.

And so, I want to deliver four simple messages.

First: science demands a significantly more ambitious response.

Second: the Paris Agreement provides the framework for action, so we must operationalize it.

Third: we have a collective responsibility to invest in averting global climate chaos, to consolidate the financial commitments made in Paris and to assist the most vulnerable communities and nations.

Fourth: climate action offers a compelling path to transform our world for the better.

Let me turn first to science.

According to the World Meteorological Organization, the 20 warmest years on record have been in the past 22 years, with the top four in the past four years.

The concentration of carbon dioxide is the highest it has been in 3 million years.

Emissions are now growing again.

The recent special report from the Intergovernmental Panel on Climate Change finds that warming could reach 1.5 degrees as soon as 2030, with devastating impacts.

The latest UN Environment Programme Emissions Gap Report tells us that the current Nationally Determined Contributions under the Paris Agreement will lead to global warming of about 3 degrees by the end of the century.

Furthermore, the majority of countries most responsible for greenhouse gas emissions are behind in their efforts to meet their Paris pledges.

So, it is plain we are way off course.

We need more action and more ambition.

We absolutely have to close this emissions gap.

If we fail, the Arctic and Antarctic will continue to melt, corals will bleach and then die, the oceans will rise, more people will die from air pollution, water scarcity will plague a significant proportion of humanity, and the cost of disasters will skyrocket.

Last year I visited Barbuda and Dominica, which were devastated by hurricanes. The destruction and suffering I saw was heart-breaking. That story is repeated almost daily somewhere in the world.

These emergencies are preventable.

Emissions must decline by 45 per cent from 2010 levels by 2030 and be net zero by 2050.

Renewable energy will need to supply half to two-thirds of the world's primary energy by 2050 with a corresponding reduction in fossil fuels.

In short, we need a complete transformation of our global energy economy, as well as how we manage land and forest resources.

We need to embrace low-carbon, climate-resilient sustainable development.

I am hopeful that the Talanoa Dialogue will provide a very strong impulse for increased ambition in the commitments for climate action.

Excellencies,

This brings me to my second point.

The Paris Agreement provides a framework for the transformation we need.

It is our job here in Katowice is to finalize the Paris Agreement Work Programme – the rule book for implementation.

I remind all Parties that this is a deadline you set for yourselves and it is vital you meet it.

We need a unifying implementation vision that sets out clear rules, inspires action and promotes raised ambition, based on the principle of equity and common but differentiated responsibilities and respective capabilities, in light of different national circumstances.

We have no time for limitless negotiations.

A completed Work Programme will unleash the potential of the Paris Agreement.

It will build trust and make clear that countries are serious about addressing climate change.

Dear Friends,

This brings me to my third point: the central importance of finance.

We need concerted resource mobilization and investment to successfully combat climate change.

We need transformative climate action in five key economic areas - energy, cities, land use, water and industry.

Some 75 per cent of the infrastructure needed by 2050 still remains to be built.

How this is done will either lock us in to a high-emissions future or steer us towards truly sustainable low-emissions development.

Governments and investors need to bet on the green economy, not the grey.

That means embracing carbon pricing, eliminating harmful fossil fuel subsidies and investing in clean technologies.

It also means providing a fair transition for those workers in traditional sectors that face disruption, including through retraining and social safety nets.

We also have a collective responsibility to assist the most vulnerable communities and countries - such as small island nations and the least developed countries - by supporting adaptation and resilience.

Making clear progress to mobilize the pledged \$100 billion dollars a year will provide a much-needed positive political signal.

I have appointed the President of France and Prime Minister of Jamaica to lead the mobilization of the international community, both public and private, to reach that target in the context of preparation of the Climate Summit I have convened in September of next year.

I also urge Member States to swiftly implement the replenishment of the Green Climate Fund.

It is an investment in a safer, less costly future.

Dear Friends,

All too often, climate action is seen as a burden. My fourth point is this: decisive climate action today is our chance to right our ship and set a course for a better future for all.

We have the knowledge.

Many technological solutions are already viable and affordable.

Cities, regions, civil society and the business community around the world are moving ahead.

What we need is political more will and more far-sighted leadership.

This is the challenge on which this generation's leaders will be judged.

Climate action is not just the right thing to do - it makes social and economic sense.

Meeting the goals of the Paris Agreement would reduce air pollution - saving more than a million lives each year by 2030, according to the World Health

Organization.

According to the recent New Climate Economy report, ambitious climate action could yield 65 million jobs and a direct economic gain of \$26 trillion US dollars compared to business as usual over the next 12 years.

We are seeing early signs of this economic transformation, but we are nowhere near where we need to be.

The transition to a low-carbon economy needs political impetus from the highest levels.

And it requires inclusivity, because everyone is affected by climate change. That is the message of the Talanoa Dialogue.

We need a full-scale mobilization of young people.

And we need a global commitment to gender equality, because women's leadership is central to durable climate solutions.

A successful conference here in Katowice can provide the catalyst.

There is now significant global momentum for climate action.

It has galvanized private business and investors around the world, while cities and regional governments are also showing that ambitious climate action is possible and desirable.

Let us build on this momentum.

I am convening a Climate Summit in September next year to raise ambition and mobilize the necessary resources.

But that ambition needs to begin here, right now, in Katowice, driven by governments and leaders who understand that their legacies and the well-being of future generations are at stake.

We cannot afford to fail in Katowice.

Some might say that it will be a difficult negotiation. I know it is not easy. It requires a firm political will for compromise. But, for me, what is really difficult is to be a fisherman in Kiribati seeing his country in risk of disappearing or a farmer or herder in the Sahel losing livelihoods and losing peace. Or being a woman in Dominica or any other Caribbean nation enduring hurricane after hurricane destroying everything in its path.

Ladies and gentlemen,

Climate change is the single most important issue we face.

It affects all our plans for sustainable development and a safe, secure and prosperous world.

So, it is hard to comprehend why we are collectively still moving too slowly - and even in the wrong direction.

The IPCC's Special Report tells us that we still have time to limit temperature rise.

But that time is running out.

We achieved success in Paris because negotiators were working towards a common goal.



Figure 16.6: Greta: “Many people say that Sweden is just a small country, and it doesn’t matter what we do. But I’ve learned that you are never too small to make a difference. And if a few children can get headlines all over the world just by not going to school, then imagine what we could all do together if we really wanted to.”

I implore you to maintain the same spirit of urgent collaboration here in Katowice with a dynamic Polish leadership in the negotiations.

Katowice must ensure that the bonds of trust established in Paris will endure.

Incredible opportunity exists if we embrace a low-carbon future and unleash the power of the Paris Agreement.

But we must start today building the tomorrow we want.

Let us rise to the challenge and finish the work the world demands of us.

Thank you.

### Greta Thunberg’s address to the opening session

Greta Thunberg (born 3 January 2003) is a Swedish climate activist. She is known for protesting outside the Swedish parliament building to raise climate change activism.

On 20 August 2018, Thunberg, then in 9th grade, decided to not attend school until the 2018 Sweden general election on 9 September after heat waves and wildfires in Sweden. Her demands were that the Sweden government reduce carbon emissions as per the Paris Agreement, and she protested via sitting outside the Riksdag every day during school hours with the sign “Skolstrejk för klimatet” (school strike for the climate). After the general elections, she continued to strike only on Fridays. The strike is now in its 17th week. The



Figure 16.7: Greta: “You only talk about moving forward with the same bad ideas that got us into this mess, even when the only sensible thing to do is pull the emergency brake. You are not mature enough to tell it like it is. Even that burden you leave to us children.”



Figure 16.8: Greta: “Until you start focusing on what needs to be done, rather than what is politically possible, there is no hope. We cannot solve a crisis without treating it as a crisis. We need to keep the fossil fuels in the ground, and we need to focus on equity. And if solutions within the system are so impossible to find, then maybe we should change the system itself.”

transcript of her address to the opening session of COP24<sup>4 5 6 7</sup> is given below,

My name is Greta Thunberg. I am 15 years old, and I'm from Sweden. I speak on behalf of Climate Justice Now!

Many people say that Sweden is just a small country, and it doesn't matter what we do. But I've learned that you are never too small to make a difference. And if a few children can get headlines all over the world just by not going to school, then imagine what we could all do together if we really wanted to.

But to do that, we have to speak clearly, no matter how uncomfortable that may be. You only speak of green eternal economic growth because you are too scared of being unpopular. You only talk about moving forward with the same bad ideas that got us into this mess, even when the only sensible thing to do is pull the emergency brake. You are not mature enough to tell it like it is. Even that burden you leave to us children.

But I don't care about being popular. I care about climate justice and the living planet. Our civilization is being sacrificed for the opportunity of a very small number of people to continue making enormous amounts of money. Our biosphere is being sacrificed so that rich people in countries like mine can live in luxury. It is the sufferings of the many which pay for the luxuries of the few.

The year 2078, I will celebrate my 75th birthday. If I have children, maybe they will spend that day with me. Maybe they will ask me about you. Maybe they will ask why you didn't do anything while there still was time to act. You say you love your children above all else, and yet you are stealing their future in front of their very eyes.

Until you start focusing on what needs to be done, rather than what is politically possible, there is no hope. We cannot solve a crisis without treating it as a crisis. We need to keep the fossil fuels in the ground, and we need to focus on equity. And if solutions within the system are so impossible to find, then maybe we should change the system itself.

We have not come here to beg world leaders to care. You have ignored us in the past, and you will ignore us again. We have run out of excuses, and we are running out of time. We have come here to let you know that change is coming, whether you like it or not. The real power belongs to the people. Thank you.

---

<sup>4</sup><https://www.youtube.com/watch?v=VFkQSGyeCWg>

<sup>5</sup><https://www.youtube.com/watch?v=0TYyBtb1PH4>

<sup>6</sup><https://www.youtube.com/watch?v=DdAOgNTxxt0>

<sup>7</sup><https://www.youtube.com/watch?v=pJ1HRGA8g10>



Figure 16.9: Greta Thunberg addresses the National Assembly In Paris on July 23, 2019 in Paris, France.



Figure 16.10: Greta Thunberg crossing the Atlantic on a small emission-free boat.

## 16.7 The UK declares a climate emergency

Introducing the motion in the House of Commons, Labour leader Jeremy Corbyn said: “We have no time to waste. We are living in a climate crisis that will spiral dangerously out of control unless we take rapid and dramatic action now. This is no longer about a distant future. We’re talking about nothing less than the irreversible destruction of the environment within our lifetimes of members of this house.”

Here are some excerpts from an article by Amy Goodman and Nermeen Shaikh of Democracy now published in Truthout on May 2, 2019.<sup>8</sup>:

On Wednesday, the House of Commons became the first parliament in the world to declare a climate emergency. The resolution came on the heels of the recent Extinction Rebellion mass uprising that shut down Central London last month in a series of direct actions. Activists closed bridges, occupied public landmarks and even superglued themselves to buildings, sidewalks and trains to demand urgent action to combat climate change. Police arrested more than 1,000 protesters. Labour Party Leader Jeremy Corbyn told Parliament, “We are witnessing an unprecedented upsurge of climate activism, with groups like Extinction Rebellion forcing the politicians in this building to listen. For all the dismissive and defensive column inches the processes have provoked, they are a massive and, I believe, very necessary wake-up call. Today we have the opportunity to say, ‘We hear you.’” We speak with George Monbiot, British journalist, author and columnist with The Guardian. His recent piece for The Guardian is headlined “Only rebellion will prevent an ecological apocalypse.” Monbiot says capitalism “is like a gun pointed at the heart of the planet. It will essentially, necessarily destroy our life-support systems. Among those characteristics is the drive for perpetual economic growth on a finite planet.”

---

<sup>8</sup><https://truthout.org/video/george-monbiot-on-the-uk-climate-emergency/>



## 16.8 Understatement of existential climate risk

Here are some excerpts from a 44-page report entitled *What Lies Beneath: The Understanding of Existential Climate Risk*, by David Spratt and Ian Dunlop<sup>9</sup>:

Three decades ago, when serious debate on human-induced climate change began at the global level, a great deal of statesmanship was on display. There was a preparedness to recognize that this was an issue transcending nation states, ideologies and political parties which had to be addressed pro-actively in the long-term interests of humanity as a whole. This was the case even though the existential nature of the risk it posed was far less clear cut than it is today.

As global institutions, such as the United Nations Framework Convention on Climate Change (UNFCCC) which was established at the Rio Earth Summit in 1992, were developed to take up this challenge, and the extent of change this would demand of the fossil-fuel-dominated world order became clearer, the forces of resistance began to mobilize. Today, as a consequence, and despite the diplomatic triumph of the 2015 Paris Agreement, the debate around climate change policy has never been more dysfunctional, indeed Orwellian.

In his book 1984, George Orwell describes a double-think totalitarian state where most of the population accepts “the most flagrant violations of reality, because they never fully grasped the enormity of what was demanded of them, and were not sufficiently interested in public events to notice what was

<sup>9</sup><https://www.breakthroughonline.org.au/>

happening. By lack of understanding they remained sane.”

Orwell could have been writing about climate change and policymaking. International agreements talk of limiting global warming to 1.5-2 degrees Celsius ( $^{\circ}\text{C}$ ), but in reality they set the world on a path of 3-5 $^{\circ}\text{C}$  of warming. Goals are reaffirmed, only to be abandoned. Coal is “clean”. Just 1 $^{\circ}\text{C}$  of warming is already dangerous, but this cannot be admitted. The planetary future is hostage to myopic national self-interest. Action is delayed on the assumption that as yet unproven technologies will save the day, decades hence. The risks are existential, but it is “alarmist” to say so.

A one-in-two or one-in-three chance of missing a goal is normalized as reasonable. Moral hazard permeates official thinking, in that there is an incentive to ignore the risks in the interests of political expediency.

Climate policymaking for years has been cognitively dissonant, “a flagrant violation of reality”. So it is unsurprising that there is a lack of understanding amongst the public and elites of the full measure of the climate challenge. Yet most Australians sense where we are heading: three-quarters of Australians see climate change as catastrophic risk, and half see our way of life ending within the next 100 years.

Politics and policymaking have norms: rules and practices, assumptions and boundaries, that constrain and shape them. In recent years, the previous norms of statesmanship and long-term thinking have disappeared, replaced by an obsession with short-term political and commercial advantage. Climate policymaking is no exception. Since 1992, short-term economic interest has trumped environmental and future human needs.

The world today emits 50% more carbon dioxide ( $\text{CO}_2$ ) from the consumption of energy than it did 25 years ago, and the global economy has more than doubled in size. The UNFCCC strives “to enable economic development to proceed in a sustainable manner”, but every year humanity’s ecological footprint becomes larger and less sustainable. Humanity now requires the biophysical capacity of 1.7 Earths annually as it rapidly chews up natural capital.

A fast, emergency-scale transition to a post-fossil fuel world is absolutely necessary to address climate change. But this is excluded from consideration by policymakers because it is considered to be too disruptive. The orthodoxy is that there is time for an orderly economic transition within the current short-termist political paradigm. Discussion of what would be safe - less warming than we presently experience - is non-existent. And so we have a policy failure of epic proportions.

Policymakers, in their magical thinking, imagine a mitigation path of gradual change to be constructed over many decades in a growing, prosperous world. The world not imagined is the one that now exists: of looming financial instability; of a global crisis of political legitimacy and “fake news”; of a sustainability crisis that extends far beyond climate change to include all the fundamentals of human existence and most significant planetary boundaries

(soils, potable water, oceans, the atmosphere, biodiversity, and so on); and of severe global energy-sector dislocation.

In anticipation of the upheaval that climate change would impose upon the global order, the IPCC was established by the United Nations (UN) in 1988, charged with regularly assessing the global consensus on climate science as a basis for policymaking. The IPCC Assessment Reports (AR), produced every five-to-eight years, play a large part in the public framing of the climate narrative: new reports are a global media event.

AR5 was produced in 2013-14, with AR6 due in 2022. The IPCC has done critical, indispensable work of the highest standard in pulling together a periodic consensus of what must be the most exhaustive scientific investigation in world history.

It does not carry out its own research, but reviews and collates peer-reviewed material from across the spectrum of this incredibly complex area, identifying key issues and trends for policymaker consideration. However, the IPCC process suffers from all the dangers of consensus-building in such a wide-ranging and complex arena. For example, IPCC reports, of necessity, do not always contain the latest available information. Consensus-building can lead to “least drama”, lowest-common-denominator outcomes, which overlook critical issues. This is particularly the case with the “fat-tails” of probability distributions, that is, the high-impact but lower-probability events where scientific knowledge is more limited.

Vested-interest pressure is acute in all directions; climate denialists accuse the IPCC of alarmism, whereas many climate action proponents consider the IPCC to be far too conservative. To cap it all, the IPCC conclusions are subject to intense political oversight before being released, which historically has had the effect of substantially watering-down sound scientific findings.

These limitations are understandable, and arguably were not of overriding importance in the early period of the IPCC. However, as time has progressed, it is now clear that the risks posed by climate change are far greater than previously anticipated. We have moved out of the twilight period of much talk, but relatively limited climate impacts, into the harsh light of physically-evident existential threats. Climate change is now turning nasty, as we have witnessed recently in the North America, East and South Asia, the Middle East and Europe, with record-breaking heatwaves and wildfires, more intense flooding and more damaging hurricanes.

The distinction between climate science and risk is the critical issue, for the two are not the same. Scientific reticence - a reluctance to spell out the full risk implications of climate science in the absence of perfect information - has become a major problem. Whilst this is understandable, particularly when scientists are continually criticized by denialists and political apparatchiks for speaking out, it is extremely dangerous given the fat-tail risks of climate change. Waiting for perfect information, as we are continually urged to do

by political and economic elites, means it will be too late to act. Time is not on our side. Sensible risk management addresses risk in time to prevent it happening, and that time is now.

Irreversible, adverse climate change on the global scale now occurring is an existential risk to human civilization. Many of the world's top climate scientists - Kevin Anderson, James Hansen, Michael E. Mann, Michael Oppenheimer, Naomi Oreskes, Stefan Rahmstorf, Eric Rignot, Hans Joachim Schellnhuber, Kevin Trenberth and others - who are quoted in this report well understand these implications and are forthright about their findings, where we are heading, and the limitations of IPCC reports.

This report seeks to alert the wider community and business and political leaders to these limitations and urges changes to the IPCC approach, to the wider UNFCCC negotiations, and to national policymaking. It is clear that existing processes will not deliver the transformation to a carbon-negative world in the limited time now available. We urgently require a re-framing of scientific research within an existential risk-management framework. This requires special precautions that go well beyond conventional risk management. Like an iceberg, there is great danger in "what lies beneath".

## Existential Risk to Human Civilization

In 2016, the World Economic Forum survey of the most impactful risks for the years ahead elevated the failure of climate change mitigation and adaptation to the top of the list, ahead of weapons of mass destruction, ranking second, and water crises, ranking third. By 2018, following a year characterized by high-impact hurricanes and extreme temperatures, extreme-weather events were seen as the single most prominent risk. As the survey noted: "We have been pushing our planet to the brink and the damage is becoming increasingly clear."

Climate change is an existential risk to human civilization: that is, an adverse outcome that would either annihilate intelligent life or permanently and drastically curtail its potential.

Temperature rises that are now in prospect, after the Paris Agreement, are in the range of 3-5 °C. At present, the Paris Agreement voluntary emission reduction commitments, if implemented, would result in planetary warming of 3.4 °C by 2100, without taking into account "long-term" carbon-cycle feedbacks. With a higher climate sensitivity figure of 4.5 °C, for example, which would account for such feedbacks, the Paris path would result in around 5 °C of warming, according to a MIT study.

A study by Schroeder Investment Management published in June 2017 found - after taking into account indicators across a wide range of the political, financial, energy and regulatory sectors - the average temperature increase implied for the Paris Agreement across all sectors was 4.1 °C.

Yet 3 °C of warming already constitutes an existential risk. A 2007 study

by two US national security think-tanks concluded that 3 °C of warming and a 0.5 meter sea-level rise would likely lead to “outright chaos” and “nuclear war is possible”, emphasizing how “massive non-linear events in the global environment give rise to massive nonlinear societal event”.

The Global Challenges Foundation (GCF) explains what could happen: “If climate change was to reach 3 °C, most of Bangladesh and Florida would drown, while major coastal cities - Shanghai, Lagos, Mumbai - would be swamped, likely creating large flows of climate refugees. Most regions in the world would see a significant drop in food production and increasing numbers of extreme weather events, whether heat waves, floods or storms. This likely scenario for a 3 °C rise does not take into account the considerable risk that self-reinforcing feedback loops set in when a certain threshold is reached, leading to an ever increasing rise in temperature. Potential thresholds include the melting of the Arctic permafrost releasing methane into the atmosphere, forest die-back releasing the carbon currently stored in the Amazon and boreal forests, or the melting of polar ice caps that would no longer reflect away light and heat from the sun.”

Warming of 4 °C or more could reduce the global human population by 80% or 90%, and the World Bank reports “there is no certainty that adaptation to a 4 °C world is possible.”

Prof. Kevin Anderson says a 4 °C future “is incompatible with an organized global community, is likely to be beyond ‘adaptation’, is devastating to the majority of ecosystems, and has a high probability of not being stable”.

This is a commonly-held sentiment amongst climate scientists. A recent study by the European Commission’s Joint Research Centre found that if the global temperature rose 4 °C, then extreme heatwaves with “apparent temperatures” peaking at over 55 °C will begin to regularly affect many densely populated parts of the world, forcing much activity in the modern industrial world to stop. (“Apparent temperatures” refers to the Heat Index, which quantifies the combined effect of heat and humidity to provide people with a means of avoiding dangerous conditions.)

In 2017, one of the first research papers to focus explicitly on existential climate risks proposed that “mitigation goals be set in terms of climate risk category instead of a temperature threshold”, and established a “dangerous” risk category of warming greater than 1.5 °C, and a “catastrophic” category for warming of 3 °C or more. The authors focussed on the impacts on the world’s poorest three billion people, on health and heat stress, and the impacts of climate extremes on such people with limited adaptation resources. They found that a 2 °C warming “would double the land area subject to deadly heat and expose 48% of the population (to deadly heat). A 4 °C warming by 2100 would subject 47% of the land area and almost 74% of the world population to deadly heat, which could pose existential risks to humans and mammals alike unless massive adaptation measures are implemented.”

A 2017 survey of global catastrophic risks by the Global Challenges Foundation found that: “In high-end [climate] scenarios, the scale of destruction is beyond our capacity to model, with a high likelihood of human civilization coming to an end.”

84% of 8000 people in eight countries surveyed for the Foundation considered climate change a “global catastrophic risk”.

Existential risk may arise from a fast rate of system change, since the capacity to adapt, in both the natural and human worlds, is inversely proportional to the pace of change, amongst other factors. In 2004, researchers reported on the rate of warming as a driver of extinction...

At 4 °C of warming “the limits for adaptation for natural systems would largely be exceeded throughout the world”.

Ecological breakdown of this scale would ensure an existential human crisis. By slow degrees, these existential risks are being recognized. In May 2018, an inquiry by the Australian Senate into national security and global warming recognized “climate change as a current and existential national security risk... defined as ‘one that threatens the premature extinction of Earth-originating intelligent life or the permanent and drastic destruction of its potential for desirable future development’”.

In April 2018, the Intelligence on European Pensions and Institutional Investment think-tank warned business leaders that “climate change is an existential risk whose elimination must become a corporate objective”.

However the most recent IPCC Assessment Report did not consider the issue. Whilst the term “risk management” appears in the 2014 IPCC Synthesis Report fourteen times, the terms “existential” and “catastrophic” do not appear...

## 16.9 The 2018 IPCC report

### Excerpts from an article summarizing the report

Here are excerpts from an article entitled **UN Experts Warn of ‘Climate Catastrophe’ by 2040** by Jesica Corbett. The article was published in Common Dreams on Monday, October 8, 2018.<sup>10</sup>:

“The climate crisis is here and already impacting the most vulnerable,” notes 350.org’s program director. “Staying under 1.5°C is now a matter of political will.”

Underscoring the need for “rapid, far-reaching, and unprecedented” changes to life as we know it to combat the global climate crisis, a new report from

---

<sup>10</sup><https://www.commondreams.org/news/2018/10/08/un-experts-warn-climate-catastrophe-2040-without-rapid-and-unprecedented-global>

the Intergovernmental Panel on Climate Change (IPCC) - the United Nations' leading body for climate science - details what the world could look like if the global temperature rises to 1.5°C versus 2°C (2.7°F versus 3.6°F) above pre-industrial levels, and outlines pathways to reducing greenhouse gas emissions in the context of sustainable development and efforts to eradicate poverty.

"Climate change represents an urgent and potentially irreversible threat to human societies and the planet," the report reads. "Human-induced warming has already reached about 1°C (1.8°F) above pre-industrial levels at the time of writing of this Special Report... If the current warming rate continues, the world would reach human-induced global warming of 1.5°C around 2040."

Approved by the IPCC in South Korea on Saturday ahead of COP24 in Poland in December, *Global Warming of 1.5°C* was produced by 91 authors and reviewers from 40 countries. Its release has elicited calls to action from climate campaigners and policymakers the world over.

"This is a climate emergency. The IPCC 1.5 report starkly illustrates the difference between temperature rises of 1.5°C and 2°C - for many around the world this is a matter of life and death," declared Karin Nansen, chair of Friends of the Earth International (FOEI). "It is crucial to keep temperature rise well below 1.5 degrees ... but the evidence presented by the IPCC shows that there is a narrow and shrinking window in which to do so."

The report was requested when the international community came together in December of 2015 for the Paris agreement, which aims to keep global warming within this century "well below" 2°C, with an ultimate target of 1.5°C. President Donald Trump's predecessor supported the accord, but Trump has vowed to withdraw the United States, even as every other nation on the planet has pledged their support for it. In many cases, however, sworn support hasn't led to effective policy.

"It's a fresh reminder, if one was needed, that current emissions reduction pledges are not enough to meet the long-term goals of the Paris agreement. Indeed, they are not enough for any appropriately ambitious temperature target, given what we know about dangerous climate impacts already unfolding even at lower temperature thresholds," Rachel Cleetus, lead economist and climate policy manager for the Union of Concerned Scientists (UCS), wrote ahead of its release.

"The policy implications of the report are obvious: We need to implement a suite of policies to sharply limit carbon emissions and build climate resilience, and we must do all this in a way that prioritizes equitable outcomes particularly for the world's poor and marginalized communities," Cleetus added.

"We want a just transition to a clean energy system that benefits people not corporations," Nansen emphasized. "Only with a radical transformation of our energy, food and economic systems, embracing environmental, social, gender and economic justice, can we prevent climate catastrophe and temperature rises exceeding 1.5°C."

## **Only immediate climate action can save the future**

Immediate action to halt the extraction of fossil fuels and greatly reduce the emission of CO<sub>2</sub> and other greenhouse gasses is needed to save the long-term future of human civilization and the biosphere.

At the opening ceremony of United Nations-sponsored climate talks in Katowice, Poland, Sir David Attenborough said “Right now, we are facing a man-made disaster of global scale. Our greatest threat in thousands of years. Climate change. If we don’t take action, the collapse of our civilizations and the extinction of much of the natural world is on the horizon. The world’s people have spoken. Their message is clear. Time is running out. They want you, the decision-makers, to act now.”

Antonio Guterres, UN Secretary-General, said climate change was already “a matter of life and death” for many countries. He added that the world is “nowhere near where it needs to be” on the transition to a low-carbon economy.

Swedish student Greta Thunberg, is a 16-year-old who has launched a climate protest movement in her country. She said, in a short but very clear speech after that of UN leader Antonio Guterres: “Some people say that I should be in school instead. Some people say that I should study to become a climate scientist so that I can ‘solve the climate crisis’. But the climate crisis has already been solved. We already have all the facts and solutions.”

She added: “Why should I be studying for a future that soon may be no more, when no one is doing anything to save that future? And what is the point of learning facts when the most important facts clearly mean nothing to our society?”

Thunberg continued: “Today we use 100 million barrels of oil every single day. There are no politics to change that. There are no rules to keep that oil in the ground. So we can’t save the world by playing by the rules. Because the rules have to be changed.”

She concluded by saying that “since our leaders are behaving like children, we will have to take the responsibility they should have taken long ago.”

## **Institutional inertia**

Our collective failure to respond adequately to the current crisis is very largely due to institutional inertia. Our financial system is deeply embedded and resistant to change. Our entire industrial infrastructure is based on fossil fuels; but if the future is to be saved, the use of fossil fuels must stop. International relations are still based on the concept of absolutely sovereign nation states, even though this concept has become a dangerous anachronism in an era of instantaneous global communication and economic interdependence. Within nations, systems of law and education change very slowly, although present dangers demand rapid revolutions in outlook and lifestyle.

The failure of the recent climate conferences to produce strong final documents can be attributed to the fact that the nations attending the conferences felt themselves to be in competition with each other, when in fact they ought to have cooperated in response to a common danger. The heavy hand of the fossil fuel industry also made itself felt at the conferences.

Until the development of coal-driven steam engines in the 19th century humans lived more or less in harmony with their environment. Then, fossil fuels, representing many millions of years of stored sunlight, were extracted and burned in two centuries, driving a frenzy of growth of population and industry that has lasted until the present. But today, the party is over. Coal, oil and gas are nearly exhausted, and what remains of them must be left in the ground to avoid existential threats to humans and the biosphere. Big coal and oil corporations base the value of their stocks on ownership of the remaining resources that are still buried, and they can be counted on to use every trick, fair or unfair, to turn those resources into money.

In general corporations represent a strong force resisting change. By law, the directors of corporations are obliged to put the profits of stockholders above every other consideration. No room whatever is left for an ecological or social conscience. Increasingly, corporations have taken control of our mass media and our political system. They intervene in such a way as to make themselves richer, and thus to increase their control of the system.

### **Polite conversation and cultural inertia**

Each day, the conventions of polite conversation contribute to our sense that everything is as it always was. Politeness requires that we do not talk about issues that might be contrary to another person's beliefs. Thus polite conversation is dominated by trivia, entertainment, sports, the weather, gossip, food, and so on. Worries about the distant future, the danger of nuclear war, the danger of uncontrollable climate change, or the danger of widespread famine seldom appear in conversations at the dinner table, over coffee or at the pub. In conversations between polite people, we obtain the false impression that all is well with the world. But in fact, all is not well. We have to act promptly and adequately to save the future.

The situation is exactly the same in the mass media. The programs and articles are dominated by trivia and entertainment. Serious discussions of the sudden crisis which civilization now faces are almost entirely absent, because the focus is on popularity and ratings. As Neil Postman remarked, we are entertaining ourselves to death.

### **Further growth implies future collapse**

We have to face the fact that endless economic growth on a finite planet is a logical impossibility, and that we have reached or passed the sustainable limits to growth.

In today's world, we are pressing against the absolute limits of the earth's carrying capacity, and further growth carries with it the danger of future collapse. In the long run, neither the growth of industry nor that of population is sustainable; and we have now reached or exceeded the sustainable limits.

The size of the human economy is, of course, the product of two factors: the total number of humans, and the consumption per capita. Let us first consider the problem of reducing the per-capita consumption in the industrialized countries. The whole structure of western society seems designed to push its citizens in the opposite direction, towards

ever-increasing levels of consumption. The mass media hold before us continually the ideal of a personal utopia, filled with material goods.

Every young man in a modern industrial society feels that he is a failure unless he fights his way to the “top”; and in recent years, women too have been drawn into the competition. Of course, not everyone can reach the top; there would not be room for everyone; but society urges us all to try, and we feel a sense of failure if we do not reach the goal. Thus, modern life has become a competition of all against all for power and possessions.

When possessions are used for the purpose of social competition, demand has no natural upper limit; it is then limited only by the size of the human ego, which, as we know, is boundless. This would be all to the good if unlimited industrial growth were desirable; but today, when further industrial growth implies future collapse, western society urgently needs to find new values to replace our worship of power, our restless chase after excitement, and our admiration of excessive consumption.

If you turn on your television set, the vast majority of the programs that you will be offered give no hint at all of the true state of the world or of the dangers which we will face in the future. Part of the reason for this willful blindness is that no one wants to damage consumer confidence. No one wants to bring on a recession. No one wants to shoot Santa Claus.

But sooner or later a severe recession will come, despite our unwillingness to recognize this fact. Perhaps we should prepare for it by reordering the world's economy and infrastructure to achieve long-term sustainability, i.e. steady-state economics, population stabilization, and renewable energy.

## **Our responsibility to future generations and to the biosphere**

All of the technology needed for the replacement of fossil fuels by renewable energy is already in place. Although renewable sources currently supply only 19 percent of the world's energy requirements, they are growing rapidly. For example, wind energy is growing at the rate of 30 percent per year. Because of the remarkable properties of exponential growth, this will mean that wind will soon become a major supplier of the world's energy requirements, despite bitter opposition from the fossil fuel industry.

Both wind and solar energy can now compete economically with fossil fuels, and this situation will become even more pronounced if more countries put a tax on carbon emissions, as Finland, the Netherlands, Norway, Costa Rica, the United Kingdom and Ireland already have done.<sup>11</sup>

Much research and thought have also been devoted to the concept of a steady-state economy. The only thing that is lacking is political will. It is up to the people of the world to make their collective will felt.<sup>12</sup>

---

<sup>11</sup><http://eruditio.worldacademy.org/issue-5/article/urgent-need-renewable-energy>

<sup>12</sup><http://steadystate.org/category/herman-daly/>

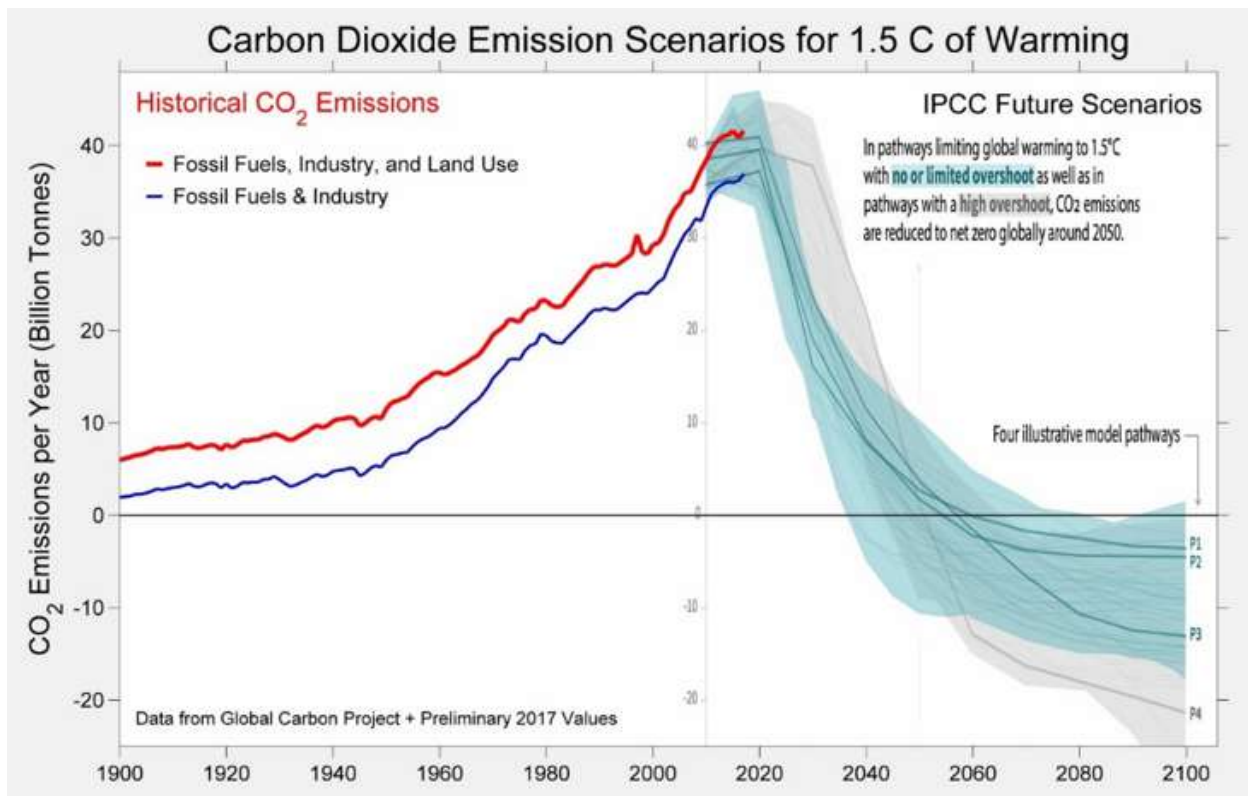


Figure 16.11: Our carbon budget. If global warming is to be limited to 1.5°C, CO<sub>2</sub> emissions must fall extremely rapidly. This means radical and fundamental changes for economies and lifestyles.

History has given to our generation an enormous responsibility towards future generations. We must achieve a new kind of economy, a steady-state economy. We must stabilize global population. We must replace fossil fuels by renewable energy. We must abolish nuclear weapons. We must end the institution of war. We must reclaim democracy in our own countries when it has been lost. We must replace nationalism by a just system of international law. We must prevent degradation of the earth's environment. We must act with dedication and fearlessness to save the future of the earth for human civilization and for the plants and animals with which we share the gift of life.

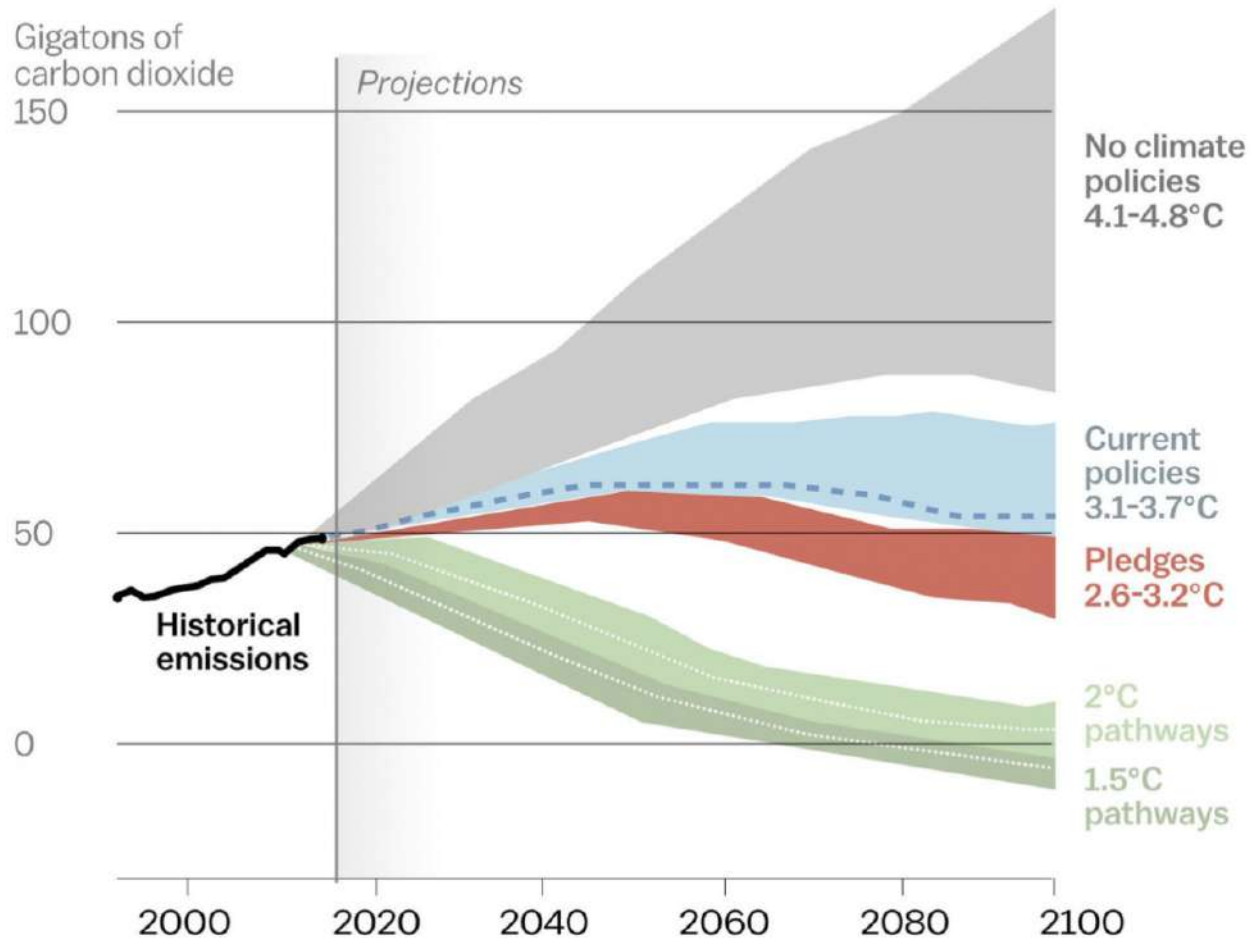
**“And yes, we do need hope. Of course, we do. But the one thing we need more than hope is action. Once we start to act, hope is everywhere. So instead of looking for hope, look for action. Then and only then, hope will come today.”**  
Greta Thunberg

### Why do we not respond to the crisis?

Today we are faced with multiple interrelated crises, for example the threat of catastrophic climate change or equally catastrophic thermonuclear war, and the threat of widespread

## Effect of current pledges and policies

*Global greenhouse gas emissions*



Source: Climate Action Tracker

**Vox**

Figure 16.12: Predicted gigatons of carbon emitted during the present century under various policies. Under current policies, temperatures at the end of the century are predicted to be 3.1-3.7°C higher than normal, which would be disastrous. This implies that quick action must be taken to change current policies.

famine. These threats to human existence and to the biosphere demand a prompt and rational response; but because of institutional and cultural inertia, we are failing to take the steps that are necessary to avoid disaster.

### Suggestions for further reading

1. A. Gore, *An Inconvenient Truth: The Planetary Emergency of Global Warming and What We Can Do About It*, Rodale Books, New York, (2006).
2. A. Gore, *Earth in the Balance: Forging a New Common Purpose*, Earthscan, (1992).
3. A.H. Ehrlich and P.R. Ehrlich, *Earth*, Thames and Methuen, (1987).
4. P.R. Ehrlich and A.H. Ehrlich, *The Population Explosion*, Simon and Schuster, (1990).
5. P.R. Ehrlich and A.H. Ehrlich, *Healing the Planet: Strategies for Resolving the Environmental Crisis*, Addison-Wesley, (1991).
6. P.R. Ehrlich and A.H. Ehrlich, *Betrayal of Science and Reason: How Anti-Environmental Rhetoric Threatens our Future*, Island Press, (1998).
7. P.R. Ehrlich and A.H. Ehrlich, *One With Nineveh: Politics, Consumption and the Human Future*, Island Press, (2004).
8. D.H. Meadows, D.L. Meadows, J. Randers, and W.W. Behrens III, *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*, Universe Books, New York, (1972).
9. D.H. Meadows et al., *Beyond the Limits. Confronting Global Collapse and Envisioning a Sustainable Future*, Chelsea Green Publishing, Post Mills, Vermont, (1992).
10. D.H. Meadows, J. Randers and D.L. Meadows, *Limits to Growth: the 30-Year Update*, Chelsea Green Publishing, White River Jct., VT 05001, (2004).
11. A. Peccei and D. Ikeda, *Before it is Too Late*, Kodansha International, Tokyo, (1984).
12. V.K. Smith, ed., *Scarcity and Growth Reconsidered*, Johns Hopkins University Press, Baltimore, (1979).
13. British Petroleum, *BP Statistical Review of World Energy*, (published yearly).
14. R. Costanza, ed., *Ecological Economics: The Science and Management of Sustainability*, Colombia University Press, New York, (1991).
15. J. Darmstadter, *A Global Energy Perspective*, Sustainable Development Issue Backgrounder, Resources for the Future, (2002).
16. D.C. Hall and J.V. Hall, *Concepts and Measures of Natural Resource Scarcity*, *Journal of Environmental Economics and Management*, **11**, 363-379, (1984).
17. M.K. Hubbert, *Energy Resources*, in *Resources and Man: A Study and Recommendations*, Committee on Resources and Man, National Academy of Sciences, National Research Council, W.H. Freeman, San Francisco, (1969).
18. Intergovernmental Panel on Climate Change, *Climate Change 2001: The Scientific Basis*, IPCC, (2001).
19. J.A. Krautkraemer, *Nonrenewable Resource Scarcity*, *Journal of Economic Literature*, **36**, 2065-2107, (1998).
20. N. Stern et al., *The Stern Review*, [www.sternreview.org.uk](http://www.sternreview.org.uk), (2006).

21. T.M. Swanson, ed., *The Economics and Ecology of Biodiversity Decline: The Forces Driving Global Change*, Cambridge University Press, (1995).
22. P.M. Vitousek, H.A. Mooney, J. Lubchenco and J.M. Melillo, *Human Domination of Earth's Ecosystems*, *Science*, **277**, 494-499, (1997).
23. World Resources Institute, *World Resources 200-2001: People and Ecosystems: The Fraying Web of Life*, WRI, Washington D.C., (2000).
24. A. Sampson, *The Seven Sisters: The Great Oil Companies of the World and How They Were Made*, Hodder and Staughton, London, (1988).
25. D. Yergin, *The Prize*, Simon and Schuster, New York, (1991).
26. M.B. Stoff, *Oil, War and American Security: The Search for a National Policy on Oil, 1941-1947*, Yale University Press, New Haven, (1980).
27. J. Stork, *Middle East Oil and the Energy Crisis*, Monthly Review, New York, (1976).
28. F. Benn, *Oil Diplomacy in the Twentieth Century*, St. Martin's Press, New York, (1986).
29. K. Roosevelt, *Countercoup: The Struggle for the Control of Iran*, McGraw-Hill, New York, (1979).
30. E. Abrahamian, *Iran Between Two Revolutions*, Princeton University Press, Princeton, (1982).
31. J.M. Blair, *The Control of Oil*, Random House, New York, (1976).
32. M.T. Klare, *Resource Wars: The New Landscape of Global Conflict*, Owl Books reprint edition, New York, (2002).
33. H. Mejcher, *Imperial Quest for Oil: Iraq, 1910-1928*, Ithaca Books, London, (1976).
34. P. Sluglett, *Britain in Iraq, 1914-1932*, Ithaca Press, London, (1976).
35. D.E. Omissi, *British Air Power and Colonial Control in Iraq, 1920-1925*, Manchester University Press, Manchester, (1990).
36. V.G. Kiernan, *Colonial Empires and Armies, 1815-1960*, Sutton, Stroud, (1998).
37. R. Solh, *Britain's 2 Wars With Iraq*, Ithaca Press, Reading, (1996).
38. D. Morgan and D.B. Ottaway, *In Iraqi War Scenario, Oil is Key Issue as U.S. Drillers Eye Huge petroleum Pool*, Washington Post, September 15, (2002).
39. C.J. Cleveland, *Physical and Economic Aspects of Natural Resource Scarcity: The Cost of Oil Supply in the Lower 48 United States 1936-1987*, *Resources and Energy* **13**, 163-188, (1991).
40. C.J. Cleveland, *Yield Per Effort for Additions to Crude Oil Reserves in the Lower 48 States, 1946-1989*, *American Association of Petroleum Geologists Bulletin*, **76**, 948-958, (1992).
41. M.K. Hubbert, *Technique of Prediction as Applied to the Production of Oil and Gas*, in *NBS Special Publication 631*, US Department of Commerce, National Bureau of Standards, (1982).
42. L.F. Ivanhoe, *Oil Discovery Indices and Projected Discoveries*, *Oil and Gas Journal*, **11**, 19, (1984).
43. L.F. Ivanhoe, *Future Crude Oil Supplies and Prices*, *Oil and Gas Journal*, July 25, 111-112, (1988).

44. L.F. Ivanhoe, *Updated Hubbert Curves Analyze World Oil Supply*, World Oil, November, 91-94, (1996).
45. L.F. Ivanhoe, *Get Ready for Another Oil Shock!*, The Futurist, January-February, 20-23, (1997).
46. Energy Information Administration, *International Energy Outlook, 2001*, US Department of Energy, (2001).
47. Energy Information Administration, *Caspian Sea Region*, US Department of Energy, (2001).
48. National Energy Policy Development Group, *National Energy Policy*, The White House, (<http://www.whitehouse.gov/energy/>), (2004).
49. M. Klare, *Bush-Cheney Energy Strategy: Procuring the Rest of the World's Oil*, Foreign Policy in Focus, (Interhemispheric Resource Center/Institute for Policy Studies/SEEN), Washington DC and Silver City NM, January, (2004).
50. IEA, *CO<sub>2</sub> from Fuel Combustion Fact-Sheet*, International Energy Agency, (2005).
51. H. Youguo, *China's Coal Demand Outlook for 2020 and Analysis of Coal Supply Capacity*, International Energy Agency, (2003).
52. R.H. Williams, *Advanced Energy Supply Technologies*, in **World Energy Assessment: Energy and the Challenge of Sustainability**, UNDP, (2000).
53. H. Lehmann, *Energy Rich Japan*, Institute for Sustainable Solutions and Innovations, Aachen, (2003).
54. D. King, *Climate Change Science: Adapt, Mitigate or Ignore*, Science, **303** (5655), pp. 176-177, (2004).
55. S. Connor, *Global Warming Past Point of No Return*, The Independent, (116 September, 2005).
56. D. Rind, *Drying Out the Tropics*, New Scientist (6 May, 1995).
57. J. Patz et al., *Impact of Regional Climate Change on Human Health*, Nature, (17 November, 2005).
58. M. McCarthy, *China Crisis: Threat to the Global Environment*, The Independent, (19 October, 2005).
59. L.R. Brown, *The Twenty-Ninth Day*, W.W. Norton, New York, (1978).
60. W.V. Chandler, *Materials Recycling: The Virtue of Necessity*, Worldwatch Paper 56, Worldwatch Institute, Washington D.C, (1983).
61. W.C. Clark and others, *Managing Planet Earth*, Special Issue, *Scientific American*, September, (1989).
62. B. Commoner, *The Closing Circle: Nature, Man and Technology*, Bantam Books, New York, (1972).
63. C. Flavin, *Slowing Global Warming: A Worldwide Strategy*, Worldwatch Paper 91, Worldwatch Institute, Washington D.C., (1989).
64. J.R. Frisch, *Energy 2000-2020: World Prospects and Regional Stresses*, World Energy Conference, Graham and Trotman, (1983).
65. J. Gever, R. Kaufmann, D. Skole and C. Vorosmarty, *Beyond Oil: The Threat to Food and Fuel in the Coming Decades*, Ballinger, Cambridge MA, (1986).
66. J. Holdren and P. Herrera, *Energy*, Sierra Club Books, New York, (1971).

67. N. Myers, *The Sinking Ark*, Pergamon, New York, (1972).
68. National Academy of Sciences, *Energy and Climate*, NAS, Washington D.C., (1977).
69. W. Ophuls, *Ecology and the Politics of Scarcity*, W.H. Freeman, San Francisco, (1977).
70. A. Peccei, *The Human Quality*, Pergamon Press, Oxford, (1977).
71. A. Peccei, *One Hundred Pages for the Future*, Pergamon Press, New York, (1977).
72. E. Pestel, *Beyond the Limits to Growth*, Universe Books, New York, (1989).
73. C. Pollock, *Mining Urban Wastes: The Potential for Recycling*, Worldwatch Paper 76, Worldwatch Institute, Washington D.C., (1987).
74. S.H. Schneider, *The Genesis Strategy: Climate and Global Survival*, Plenum Press, (1976).
75. P.B. Smith, J.D. Schilling and A.P. Haines, *Introduction and Summary*, in *Draft Report of the Pugwash Study Group: The World at the Crossroads*, Berlin, (1992).
76. World Resources Institute, *World Resources*, Oxford University Press, New York, (published annually).
77. J.E. Young, John E., *Mining the Earth*, Worldwatch Paper 109, Worldwatch Institute, Washington D.C., (1992).
78. J.R. Craig, D.J. Vaughan and B.J. Skinner, *Resources of the Earth: Origin, Use and Environmental Impact, Third Edition*, Prentice Hall, (2001).
79. W. Youngquist, *Geodestinies: The Inevitable Control of Earth Resources Over Nations and Individuals*, National Book Company, Portland Oregon, (1997).
80. M. Tanzer, *The Race for Resources. Continuing Struggles Over Minerals and Fuels*, Monthly Review Press, New York, (1980).
81. C.B. Reed, *Fuels, Minerals and Human Survival*, Ann Arbor Science Publishers Inc., Ann Arbor Michigan, (1975).
82. A.A. Bartlett, *Forgotten Fundamentals of the Energy Crisis*, American Journal of Physics, **46**, 876-888, (1978).
83. N. Gall, *We are Living Off Our Capital*, Forbes, September, (1986).
84. M. Anklin et al., *Climate instability during the last interglacial period recorded in the GRIP ice core*. Nature **364**, 15 July: 203-207, (1993).
85. O. J. Blanchard and S. Fischer, *Lectures on Macroeconomics*. Cambridge, Mass.: MIT Press. (1989).

# Index

- A new Joan of Arc, 299
- A prayer of Saint Francis, 44
- Abrupt climate change, 214, 219
- Absolutely sovereign nation-states, 328
- Accelerated melting, 218
- Accelerating technology, 18
- Acids and bases defined, 98
- Activation energy, 98
- Advertisers on mass media, 289
- Advertising-driven consumerism, 11
- Africa, 148, 151, 154, 156
- African cultures, 10
- African Union, 183
- Agricultural research, 147
- Agricultural yields, 151
- Agriculture, 152
- Air travel, 295
- Al Gore, 101, 283
- Albedo effect, 217, 220
- Albert Schweitzer, 9, 41
- Alexandria Ocasio-Cortez, 235, 239
- Alley, Richard B., 213
- Alliance for Climate Protection, 283
- Alternative media, 289
- Alternative Nobel Prize, 205
- Amazon deforestation causes, 176
- Amazon rainforest, 176, 310
- Amazon rainforest dieback, 219
- Amy Goodman, 276
- An experiment in simple living, 56
- An Inconvenient Truth, 101, 283
- Ancient Futures, 245, 250
- Ancient Wisdom, Modern World, 9
- Anderson, Kevin, 324, 325
- Animal feed, 153
- Anne H. Ehrlich, 133
- Antarctic ice cap, 213
- Antarctic sea ice loss, 219
- Apollo Gia Project, 213
- Aquifers, 151, 154
- Aquifers overdrawn, 212, 258
- Arable land, 148, 180
- Archbishop of Buenos Aires, 187
- Arctic methane release, 219
- Arctic permafrost, 325
- Arctic sea ice loss, 213, 218, 219
- Arctic temperatures, 213
- Are we evil?, 296
- Area of cropland, 151
- Area under food production, 152
- Argentina, 147
- Arid grasslands, 151
- Aridity, 153, 211, 257
- Arrhenius, Svante, 98, 295
- Articles dominated by trivia, 329
- Astonishing deceit, 279
- Atmosphere of Venus, 201
- Atmospheric water vapor, 217
- Atrocities committed by conquistadors, 25
- Attack on the Amazon rainforest, 176
- Attenborough, Lord Richard, 265
- Attenborough, Sir David, 265, 275, 277, 298, 328
- Australia, 147
- Avi Lewis, 232
- Baby Tooth Survey, 141
- Bangladesh, 211, 257
- Bangladesh threatened, 215
- Bangladesh under water, 325
- Barack Obama, 138, 172, 198

- Bargaining powers, 27
- Baring, Anne, 24
- Barlow, Maude, 245, 252, 253
- Baron Hugo van Lawick, 123
- Barry Commoner, 141
- Bazant, Martin, 263
- BBC, 277
- BBC Television Division, 265
- Beatrix Potter, 107
- Becoming less of a brat, 231
- Bee keeping, 170
- Bee populations declining, 117
- Bee-keeping, 183
- Beef and methane, 180
- Beef Industry in South America, 176
- Beef killing the rainforest, 176
- Before the Flood, 197
- Behavior of early humans, 121
- Behavior of wild chimpanzees, 121
- Bergoglio, Jorge Mario, 187
- Bernie Sanders, 235
- Betrayal of Science, 134
- Betterment of the poor, 187
- Bhutan, 10
- Big coal and oil corporations, 329
- Bilateral tax agreements, 27
- Biodiversity, 7, 17, 194, 242, 323
- Biological diversity, 245, 252
- Biology and Society, 134
- Biology of Natural Systems, 141
- Biophysical capacity, 322
- Biosphere is being sacrificed, 317
- Birth control, 147, 161, 181
- Birth control programs, 161
- Birth of an Island, 111
- Boer War, 25
- Bolsonaro, Jair, 176, 310
- Boltzmann, Ludwig, 98
- Boreal forest dieback, 219
- Borlaug, Norman, 146, 148
- Botany, 67
- Brazil, 148
- Brazil subsidizes beef industry, 176
- Bringing the Food Economy Home, 250
- Brown, Lester R., 154, 257
- Brundtland Report, 152, 153
- Buddhism, 8
- Buddhist traditions, 9
- Bunsen, Robert, 91
- Burning of peatlands, 175
- Cairo population conference, 162
- Cambridge University, 127, 265
- Canada, 147
- Canticle of the Sun, 41, 43
- Capitalism, 235
- Capitalism Killed Our Climate, 232
- Carbon budget, 299, 331
- Carbon dioxide, 92, 98
- Carbon emissions, 211, 257
- Carbon footprint, 299
- Carbon tax, 198
- Carbon-negative world, 324
- Caring for ecosystems, 195
- Carrying capacity, 7, 11, 147
- Carson, Rachel, 107
- Case Against the Global Economy, 255
- Catastrophic climate change, 209, 288, 295, 309, 321, 333
- Cattle ranching in Amazonia, 176
- Causes of Amazon deforestation, 176
- Cerrado, 148
- Change is coming, 317
- Change of diet, 180
- Change the system, 317
- Charles David Keeling, 101
- Checks to population growth, 181
- Chemical pesticides, 113
- Child author, 107
- Child prodigy, 98
- Chimpanzee's relationship to humans, 121
- China, 151, 154, 161, 211, 258
- China's Great Green Wall, 183
- China's palm oil demand, 175
- Chinese civilization, 7
- Chinese economy, 257

- Chomsky, Noam, 245  
Christian ethics, 41  
Chronic flooding, 214  
Citizens Party, 141  
Civil Disobedience, 65  
Civil Works Administration, 209  
Civilian Construction Corps, 209  
Civilization coming to an end, 326  
Clean energy, 327  
Clean energy economy, 235  
Climate action, 19  
Climate change, 151, 153, 211, 257  
Climate change denial, 207, 275, 286  
Climate Change: The Facts, 278  
Climate crisis, 209, 235, 299, 302, 326  
Climate emergency, 209, 242, 309, 320, 327  
Climate justice, 296  
Climate Justice Now, 317  
Climate tipping points, 220  
Climate-driven refugees, 310  
Climate-linked disasters, 276  
Clock is ticking, 235  
CO<sub>2</sub> measurements, 101  
Coastal cities threatened, 214  
Collapse of our civilization, 277, 298, 328  
Colombia University, Climate Science, 201  
Colonialism, 7, 25  
Come together and save ourselves, 288  
Come with a plan, 309  
Commodification of water, 252  
Commoner's US presidential campaign, 141  
Commoner, Barry, 141  
Compassion for all living things, 41  
Concerns are justified, 306  
Conductivity of electrolytes, 98  
Conference on the Human Environment, 170  
Conflict-related deaths, 181  
Confucian teachings, 8  
Conservation, 238  
Construction and maintenance, 152  
Consume more, 289  
Consumption per capita, 330  
Consumption-oriented values, 245  
Contamination of groundwater, 215  
Cooking, 152  
COP24, 277, 315, 327  
Corbyn, Jeremy, 320  
Corn silk, 153  
Corporate oligarchs, 207  
Corporate Theft of the World's Water, 253  
Corrupt governments, 175  
Cosmetics and palm oil, 175  
Council of Canadians, 253  
Crimes against indigenous peoples, 24  
Crop failures, 153, 211, 257  
Cropland, 156  
Cropland per capita, 157, 161  
Cropland, area of, 151  
Cropland, limitations on, 148  
Cultural diversity, 7, 245, 252  
Cultural history, 19  
Cultural inertia, 329, 333  
Custodial attitude to land use, 10  
Cut subsidies to oil, 198  
  
Dakar, 183  
Dalai Lama, 9  
Danish islands threatened, 215  
Darkened snow, 218  
Davos Economic Forum, 299  
DDT, 113, 117  
Deaths from heat, 181  
Deforestation, 156, 157, 188  
Deforestation in Amazonia, 176  
Deforestation in the tropics, 17  
Degradation of topsoil, 117, 157  
Delaware-sized iceberg, 214  
Demand, 151  
Democracy Now, 209  
Democratic National Committee, 239  
Democratic Party primary election, 207  
Demographic trap, 161  
Depletion of minerals in soil, 151  
Depression, 207  
Desalination technology, 263  
Desertification, 151, 181

- Destroying civilization, 18
- Destruction of forests, 156, 275
- Devastating impacts of climate change, 198
- Developing countries, 27
- Development, 161
- Diamagnetism, 92
- DiCaprio, Leonardo, 197
- Dietary changes can help, 180
- Disaster, 275
- Disasters might wake public, 275
- Disease-resistant strains, 148
- Distribution problems, 151
- Djibouti, 183
- Doctor Doolittle, 121
- Donald Trump, 235, 279
- Double-think totalitarian state, 322
- Doubling time, 18
- Drought, 151
- Dry-season water supply, 211, 258
- Drying of forests and fires, 219
- Duty of Civil Disobedience, 65
- Duty towards the distant future, 10
- Dysentery, 161
- E.O. Wilson, 17
- Earth is our mother, 19
- Earth's atmosphere, 92, 201
- Earth's entire land surface, 180
- Eastern Asia, 148
- Ecological breakdown, 326
- Ecological conscience, 223, 329
- Ecological counter-culture, 55
- Ecological emergency, 242
- Ecological footprint, 322
- Ecological justice, 242
- Ecological stewardship, 256
- Ecology, 245
- Ecology and Buddhism, 251
- Economic costs of flooding, 216
- Economic inequality, 235
- Economic justice, 183
- Economic tipping point, 285
- Economics of Climate Change, 250
- Economics of growth, 7
- Economics of Happiness, 250
- Economy of exclusion, 198
- Education for women, 161, 162
- Edward Frankland, 91
- Ehrlich, Anne H., 133
- Ehrlich, Paul R., 133
- Ellery Channing, 56
- Emergency, 320
- Emergency-scale transition, 289
- Emissions have to stop, 296
- Emissions reduction curve, 288
- Empty-world economics, 18
- Encouraging harmony, 252
- End of the fossil fuel era, 146, 207
- Endangering nature, 265
- Energy, 138
- Energy inputs of agriculture, 152
- Energy-intensive agriculture, 147, 152
- Entertaining ourselves to death, 329
- Environmental carrying capacity, 7
- Environmental catastrophe, 287
- Environmental conservation, 170, 172
- Environmental crisis accelerates, 287
- Environmental degradation, 169
- Environmental disaster, 289
- Environmental ethics, 245
- Environmental policies, 68
- Equilibrium economics, 7
- Equity, 296
- Erosion, 156
- Ethical principals of Christianity, 10
- Eunice Newton Foote, 92
- Europe, 25
- European Parliament, 307
- Evangelli Gaudium, 198
- Evil must be resisted, 66
- Excessive human development, 265
- Existential risk, 321
- Existential risk to civilization, 324
- Experimental physics, 91
- Exponential growth, 18, 330
- Extinction, 17

- Extinction Rebellion, 242, 279, 320  
Extinctions, 211, 257  
Extreme heatwaves, 325  
Extreme weather conditions, 211, 257  
Extreme-weather events, 324
- Fabians, 25  
Failure of epic proportions, 322  
Failure of monsoons, 212, 258  
Failure to respond adequately, 328  
Fake news, 323  
Falling water tables in China, 257  
Family planning, 161, 181  
Famine, 147, 154, 161, 181, 333  
Famine and refugees, 146  
Famine in Africa, 257  
FAO, 148, 176, 180  
Faraday, Michael, 92, 98  
Farm buildings, 152  
Farm Security Administration, 209  
Fascination with Africa, 121  
Father of the National Parks, 67  
Favelas, 161  
FDR's New Deal, 207, 209, 237  
Federico Fellini, 51  
Feed for livestock, 180  
Feedback loop, definition, 217  
Feedback loops, 223, 325  
Feedstocks for fertilizer, 152  
Feedstocks for pesticides, 152  
Fertilizers, 151, 152  
Field machinery, 152  
Fighting Global Corporate Rule, 253  
Financial reforms and regulations, 209  
Florida under water, 325  
Flowers, Margaret, 235  
Fly more, 289  
Focus on what needs to be done, 315  
Food and Agricultural Organization, 176, 180  
Food and refugee crisis, 146  
Food calorie outputs, 152  
Food calories per capita, 153  
Food insecurity in West Africa, 212, 258  
Food per capita, 157  
Food processing, 170, 183  
Food production, 148  
Food-exporting countries, 147  
Forest die-back, 325  
Forest drying and wildfires, 182  
Forest drying feedback loop, 182  
Forest fires, 219  
Forest loss, 156  
Forest loss and population, 181  
Forest resources, 181  
Forestry, 170, 183  
Forests cleared and burned, 17  
Former Soviet Republic, 148  
Fossil fuel corporations, 207, 286  
Fossil fuel dependence, 235  
Fossil fuel energy inputs, 152  
Fossil fuel extraction must stop, 298, 328  
Fossil fuels, 17, 100, 151, 152, 328, 330  
Fossil hominids, 123  
Fragile ecological systems, 17  
Francis Poulenc, 52  
Franco Zeffirelli, 51  
Frankland, Sir Edward, 91  
Franz Liszt, 51  
Fresh water scarcity, 257  
Fridays for the Future, 302  
From Argentina to Rome, 187  
From mall-junkie to environmentalist, 231  
Full-world economics, 18  
Future generations, 10, 307  
Future human needs, 322
- Gandhi, 56, 265  
Garden of Earthly Delights, 198  
Genocides in the Americas, 25  
Geology, 67, 68  
Giampietro, Mario, 152  
Giotto, 43, 46  
Give voters knowledge, 18  
Glacial melting, 212, 259  
Glacial periods, 154  
Glaciers, 68

- Glaciers, melting of, 211, 257, 258
- Global catastrophic risk, 326
- Global Challenges Foundation, 325, 326
- Global Climate Disruption, 138
- Global climate strike, 302
- Global ethics, 19
- Global governance, 147
- Global Green New Deal, 237
- Global inequalities, 306
- Global use of fresh water, 259
- Global warming, 100, 151, 175, 211, 257, 306
- Global Work Party, 205
- Goals of education, 18
- Gobi desert, 182
- Goddard Institute, Space Studies, 201
- Gombe research project, 123
- Goodall, Jane, 121
- Goodman, Amy, 209, 320
- Gore, Al, 101, 283
- Governments left to wither, 288
- Grain production, 157
- Grand Canyon National Park, 78
- Grasslands, 151
- Great Depression, 107, 209
- Great Green Wall, 183
- Green Belt Movement, 170, 172, 183
- Green New Deal, 207, 209, 235
- Green Revolution, 148, 152
- Greenhouse effect, 98, 218
- Greenhouse gas emissions, 242
- Greenhouse gases, 188
- Greenland ice cap, 213
- Greenland ice cores, 219
- Greenland ice feedback loop, 217
- Greenland ice more vulnerable, 216
- Greenland's icecap melting fast, 215
- Greta Thunberg, 98
- Greta Thunberg's TED talk, 295
- Grey Owl, 265
- Groundwater, 154
- Growth, 55
- Growth implies future collapse, 329
- Growth is not sustainable, 18
- Growth of population and industry, 329
- Guardian, 320
- Guterres, Antonio, 298, 309, 310, 328
- Högbom, Arvid, 100
- Habitat I, 170
- Halt extraction of fossil fuels, 298, 328
- Halving CO<sub>2</sub> by 2030, 306
- Hansen's testimony to Congress, 202
- Hansen, James, 201, 324
- Harmony with nature, 7, 11, 55
- Harvard University, 55, 137
- Healthcare a human right, 207
- Heat waves, 211, 257
- Heat waves in Sweden, 317
- Helena Bonham Carter, 51
- Helena Norberg-Hodge, 245
- Henderson, Bill, 288
- Henry David Thoreau, 55, 66, 68
- Hepatitis, 161
- Hieronymus Bosch, 198
- High-yield grain varieties, 151, 152
- High-yield strains, 148
- Higher status for women, 162
- Highway development, 157
- Hillsides, 156
- Himalayas, 211, 258
- Hindu Kush, 211, 258
- Hindu traditions, 9
- Hinduism, 8
- Hobson, John Atkinson, 25
- Holdren, John P., 137
- Hong Kong, 161
- Hospitality, 245
- House of Commons, 320
- Human ecology, 133
- Human ego is boundless, 330
- Human misery, 148
- Human rights abuses, 175
- Humanity on a Tightrope, 134
- Hurricanes becoming more severe, 215
- Hurricanes Harvey, Irma and Maria, 275
- Hurricanes more severe, 323

- Ice cores, 213
- Illegal burning of forests, 175
- Imagine what we could do together, 297
- Immediate action required, 298, 328
- Imperialism: A Study, 25
- Inappropriate agriculture, 182
- Inballanced diet, 117
- Increasing global temperature, 17
- India, 148, 211, 257
- India's palm oil demand, 175
- India: reverence for all life, 8
- Indian monsoon disruption, 219
- Indigenous peoples, 24, 41, 223, 237
- Individual conscience, 55
- Indonesia, 161, 175
- Indonesia's forest loss, 175
- Industrial infrastructure, 328
- Industrial Recovery Act, 209
- Industrial Revolution, 25
- Industrial societies, 245
- Industrialized countries, 7
- Industrialized societies, 252
- Infrared radiation, 92, 100
- Infrastructure, 161, 207, 209
- Inland rainfall, 156
- Inorganic fertilizer, 152
- Input/output ratio, 152
- Insect apocalypse, 117
- Institutional inertia, 328, 333
- Intense flooding, 323
- Intensive farming practices, 117
- Interconnectedness, 252
- International Geophysical Year, 101
- International law, 147
- Inuit culture, 10
- Invest in renewables, 198
- IPCC, 151, 211, 257, 283, 306, 323, 326, 327
- IPCC report from Incheon, 2018, 309
- Irish Potato Famine, 151
- Irreversible adverse climate change, 324
- Irrigation, 151, 152, 157
- It's not too late, 279
- Jacquetta Hawkes, 265
- Jair Bolsonaro, 176
- James Hansen, 201
- James Hansen's TED talk, 202
- James Russell Lowell, 58
- James van Allen, 201
- Jane Goodall, 121
- Jane Goodall Institute, 127
- Jane Goodall's key discoveries, 123
- Japan, 25, 161
- Jean Baptiste Joseph Fourier, 92
- John Muir, 67
- John P. Holdren, 137
- John Stuart Mill, 147
- John Tyndall, 91
- Jorge Mario Bergoglio, 187
- Karlheinz Stockhausen, 52
- Karma, 9
- Keeling curve, 101
- Keeling, Charles David, 101
- Keeling, Ralph, 101
- Keep that oil in the ground, 298, 328
- Kennedy Airlift, 169
- Kenya, 172
- Kevin Zeese, 235
- Keynes, John Maynard, 237
- Klein, Naomi, 231, 235, 276
- Ladakh, 250
- Lake Tahoe, 68
- Land of the Spotted Eagle, 11
- Land surface used for cattle, 180
- Landscape fires kill 100,000/y, 175
- Lapham, Robert J., 161
- Last frontier, 148
- Laterite, 157
- Laterization of soil, 157
- Laterization of the soil, 17
- Latin America, 148
- Leakey, Louis, 121
- Learning to live in harmony, 7
- Leeching by rain, 157

- Lenton, Timothy Michael, 219
- Leo Sowerby, 52
- Leonardo DiCaprio, 197
- Lerma Rogo, 148
- Lester R. Brown, 257
- Lewis, Avi, 232
- Libya, 154
- Licences to burn forests, 175
- Limitations on cropland, 148
- Limiting fossil fuel production, 288
- Limiting global warming to 1.5°C, 309
- Limits for adaption, 326
- Limits to Growth, 329
- Line in the sand, 309
- Livestock feed, 152
- Local Futures, 245
- Localization issues, 251
- Long-term sea level rise, 216
- Look for action. Then hope will come, 331
- Looming financial instability, 323
- Lord Richard Attenborough, 265
- Loss of flying insects, 117
- Louis Leakey, 121
- Love for animals, 121
- Love for nature, 107
- Low-carbon economy, 298, 328
- Luther Standing Bear, 11, 41
- Luxuries, 56
- Luxuries of the few, 317
  
- Maathai, Wangari, 169, 172, 183
- Mahatma Gandhi, 10, 11, 66
- Mahler, Halfdan, 160
- Making excuses, 287
- Making Peace with the Planet, 141
- Malaria, 117
- Maldives threatened, 214
- Malnutrition, 117
- Man and the Ecosphere, 133
- Man-made disaster, 298, 328
- Manchester Guardian, 25
- Mann, Michael E., 324
- Manufactured goods, 25
  
- Margaret Flowers, 235
- Marginal land, 148, 156, 157
- Marine biologist, 107
- Market mechanisms, 238
- Markets, 25
- Markets solve all problems?, 288
- Martin Luther King, 56, 66
- Mass media, 245, 275, 296, 329, 330
- Mass production, 7
- Massacre of female students, 231
- Massive non-linear events, 325
- Maude Barlow, 245, 252
- Maudlin, W. Parker, 161
- Mauna Loa Observatory, 101
- McKibben, Bill, 204, 205, 235
- Meat consumption, 153
- Melting glaciers, 146
- Melting of Arctic ice, 212, 258
- Melting of glaciers, 211, 257, 258
- Melting of polar ice, 211, 257
- Melting of polar icecaps, 188, 325
- Methane, 92
- Methane and beef, 180
- Methane hydrate feedback loop, 218, 220
- Methane plumes, 213
- Methane, 10,000 gigatons, 218
- Mexican War, 55
- Michael Faraday, 92
- Microscopic fixes for vast problems, 287
- Middle East, 154
- Migration to cities, 161
- Military strength, 25
- Mill, John Stuart, 147
- Mines, 25
- Mining ancient groundwater, 212, 258
- MIT News, 263
- Modern market economies, 11
- Monbiot, George, 286, 320
- Monetizing “assets”, 286
- Money and growth our main concerns, 299
- Mono-cropping, 117
- Monsoon, 211, 257
- Monsoon disruption, 219

- Monsoon failures, 212, 258
- Moral responsibility, 299
- More than hope, we need action, 298
- Mother Earth, 19
- Muir Woods, 78
- Muir, John, 67
- Multi-century sea level rise, 216
- Multi-meter sea level rise, 216
- Multiple interrelated crises, 333
- My Indian Boyhood, 11
- My People, the Sioux, 11
- Myopic national self-interest, 322
  
- Naomi Klein, 231, 276
- Narrow and shrinking window, 327
- NASA, 201
- Nathaniel Hawthorne, 56
- National Book Award, 111
- National Council of Women of Kenya, 170
- National Geographic Society, 127
- National parks, 78
- Nationalism a dangerous anachronism, 19, 328
- Natural environment, 275
- Natural gas, 152
- Nature as the great teacher, 67
- Nature, Man and Technology, 141
- Near East, 148
- Negative Arctic Oscillation, 213
- Neocolonialism, 27
- Neoliberalism, 288
- Netherlands threatened, 215
- New economic system, 245
- New goals for education, 14
- New Joan of Arc, 299
- Nigeria, 181
- Nitrogen, 92
- Nkrumah, Kwami, 27
- No Logo, 232
- No one ever talked about it, 295
- Noam Chomsky, 245
- Nobel Peace Prize, 101, 138, 146, 170, 172, 231, 283
- Nobel Prize in Chemistry, 98
- Non-anthropocentric ethics, 9
- Non-renewable resources, 7, 11
- Non-violence, 243
- Nonviolent civil disobedience, 55
- Norberg-Hodge, Helena, 245
- Norman Borlaug, 146
- North Atlantic Anomaly, 212, 258
- Northern Africa, 148
- Nuclear war is possible, 325
- Nuclear weapons, 141
- Nuremberg Principles, 56
- Nutrient-poor soils, 157
  
- Obama, Barack, 138, 172, 198, 237
- Obscenely enormous military budget, 209
- Ocasio-Cortez, Alexandria, 207, 209, 235, 237
- Ocean current changes, 212, 258
- Ocean currents, 211, 257
- Ocean level rises, 211, 257
- Ogallala aquifer, 151, 155, 212, 258
- Oklahoma, 151
- Operation Sophia (a genocide), 25
- Optimum global population, 147
- Orgies of consumerism, 11
- Orwell, George, 322
- Our Common Future, 152
- Our house is on fire, 299
- Our leaders are behaving like children, 298, 328
- Our older brothers can help us, 24
- Overgrazing, 151, 182
- Overuse of pesticides, 113
- Oxygen, 92
  
- Pace of change, 326
- Pacific islands threatened, 214
- Packaging and retailing, 152
- Pakistan, 148, 151, 211, 257
- Palm oil and biodiversity, 175
- Palm oil cultivation, 175
- Palm oil plantations, 175
- Palm oil production, 275

- Paraguay, 161
- Paris Agreement, 235, 279, 296, 306, 321, 324, 327
- Paris goals, 288
- Parker, Laura, 214
- Pasturage, 148, 156
- Paul Hindenmith, 51
- Paul R, Ehrlich, 133
- Peanut butter and palm oil, 175
- Peat fires, 175
- Peatlands, 175
- Pelosi, Nancy, 209, 237
- Per capita food calories, 153
- Permafrost melting, 219
- Persiatant effects of colonialism, 25
- Persistent organic pollutants, 117
- Personal utopia, 330
- Pesticides, 151, 152
- Petroleum, 152
- Petroleum price, 147
- Petroleum-derived fertilizer, 117
- Physical chemistry, 98
- Physicians for Social Responsibility, 231
- Pimental, David, 152, 157
- Planetary boundaries, 323
- Plant diseases, 151
- Plant energy, 153
- Plant genetics, 148
- Plantations, 25
- Plasma physics, 137
- Polar ice, melting, 211, 257
- Policymakers' magical thinking, 323
- Policymaking cognitatively dissonant, 322
- Polite conversation, 329
- Political expediency, 322
- Political will, 275, 310
- Politics of global warming, 286
- Poor rural communities, 181
- Pope Francis I, 187, 188, 223, 307
- Pope Francis meets Leonardo DiCaprio, 197
- Pope Gregory IX, 44
- Pope Innocent III, 41
- Pope John Paul II, 187
- Popularity and ratings, 329
- Population Action International, 181
- Population and forest loss, 181
- Population crash, 147
- Population density, 147
- Population growth, 7, 151
- Population growth and poverty, 160
- Population stabilization, 161, 330
- Population, Resources, Environments, 133
- Populations in the tropics, 181
- Positive feedback loops, 217
- Post-fossil fuel world, 322
- Post-fossil-fuel era, 153
- Postman, Neil, 329
- Potentially irreversible threat, 327
- Potsdam Institute, 216
- Power, 55
- Power and possessions, 330
- Power over nature, 18
- Power, Dominance, Growth, Profit, 11, 14
- Power-worshiping values, 245
- PR offensives, 279
- Prakash, Varshini, 209
- Prayer of apology, 10
- Prayer of Saint Francis, 44
- Pre-industrial societies, 7
- Predatory delay, 288
- Preindustrial societies, 55
- Preventing an ecological apocalypse, 286
- Price of petroleum, 147
- Prince Albert, 92
- Principles of Political Economy, 147
- Profits of stockholders, 329
- Progressive values, 207
- Protesting at the Swedish parliament, 315
- Public health, 161
- Public work projects, 209
- Pugwash Conferences, 135, 137
- Pull the emergency brake, 315
- Pythagorean concept of harmony, 7
- Qaddafi, Muammar, 154
- Queens College, 141

- Quick action must be taken, 331
- Rachel Carson, 107
- Racism, 207, 235
- Radical transformation, 327
- Radioactive contamination, 141
- Rainfall, 151, 154, 211, 257
- Ralph Waldo Emerson, 56, 61, 68
- Rapid and unprecedented changes, 327
- Rapid change is required, 297
- Rate of extinction, 17
- Reaction kinetics, 98
- Real power belongs to the people, 317
- Recession will come, 330
- Record-breaking heatwaves, 323
- Reforestation initiatives, 183
- Reformed teaching of history, 19
- Regenerative culture, 242
- Reinvestment, 25
- Renewable energy, 207, 330
- Renewable energy infrastructure, 209
- Replanting forests, 183
- Resource curse, 27
- Respect for nature, 10, 55, 245
- Respect for the environment, 147
- Respecting natural limits, 252
- Responsibility towards future generations, 331
- Restrict air travel, 280
- Restricting air travel, 295
- Rethinking Industrial Agriculture, 250
- Reverence for Life, 9, 41
- Revolutions in outlook and lifestyles, 328
- Rice-growing river deltas, 215
- Right Livelihood Award, 253
- Rights of Mother Earth, 19
- Rio Earth Summit, 321
- Rise by 1.84-5.49 m by 2500, 216
- Rising death rates, 181
- Risk to human civilization, 324
- Robert Bunsen, 91
- Robinson, Alexander, 216
- Rockefeller Foundation, 148
- Roosevelt, Franklin D., 207, 237
- Roosevelt, Theodore, 68
- Roots and Shoots, 127
- Rotblat, Sir Joseph, 138
- Royal Institution, 91, 92
- Rules have to be changed, 298
- Run-off of water, 183
- Russell-Einstein Manifesto, 137
- Sahara desert, 182
- Sahel, 151, 182, 183
- Saint Clare, 46
- Saint Francis of Assisi, 9–11, 41, 187
- Salination, 151, 157
- Sand dunes near Beijing, 182
- Sanders Institute, 235
- Sanders, Senator Bernie, 207, 235
- Satellite based data, 213
- Saturation pressure, 217
- Saudi Arabia, 154
- Saving the future, 297, 298, 328
- Saving threatened species, 275
- Schoolstrike for climate action, 302
- Schumacher College in England, 251
- Science, 306
- Science and Survival, 141
- Science and technology, 7
- Science means nothing to politicians, 297
- Science of Ecology, 134
- Sea ice loss, 218
- Sea level projections to 2500, 216
- Sea level rise, 215, 219, 223
- Sea level rise, long term, 216
- Sea level rise, short term, 214
- Season of Smoke, 276
- Seed, 153
- Seizing land from local people, 175
- Sense of duty and tradition, 10
- Sense of urgency, 198
- Sequestered carbon, 156
- Sermon on the Mount, 10
- Severe hurricanes, 323
- Shallow ice-free seas, 213
- Shock electrolysis, 263

- Shooting Santa Claus, 330
- Short-term political advantage, 322
- Sierra Club, 68, 133, 250, 253
- Simplicity, 55
- Simplify your life, 58
- Singapore, 161
- Sir David Attenborough, 265, 275
- Sir David testifies in Parliament, 279
- Sir Frederick Gowland Hopkins, 265
- Sir Joseph Rotblat, 138
- Sixth mass extinction, 296
- Slashing and burning, 175
- Slum archbishop, 187
- Slums, 161
- Soap and palm oil, 175
- Social conscience, 223, 329
- Social costs of coastal flooding, 216
- Social ethics, 245
- Social games, 296
- Social inequality, 151
- Social Security Administration, 209
- Society of Jesus (Jesuits), 187
- Soil erosion, 151, 157, 181, 183
- Solar energy, 330
- Solutions exist, 306
- Sonora 64, 148
- Soot particles, 218
- Southeast Asia, 175
- Southeast Asia's food supply, 212, 258
- Southern Africa, 148
- Southern Asia, 148
- Speak out in clear language, 299
- Staggering ignorance of Trump, 279
- Standing Bear, Lakota chief, 10
- Stanford University, 133, 137
- Steady-state economics, 7, 330
- Stein, Jill, 237
- Stern Report, 151, 154, 156, 211, 257
- Stern, Sir Nicholas, 211, 257
- Stockholm Convention, 117
- Stop fossil fuel extraction, 275
- Stop the expansion of extraction, 288
- Storm surges, 215
- Storms of My Grandchildren, 201
- Strengthening Local Economies, 250
- Stronger social safety net, 235
- Strontium 90, 141
- Struggle for power and possessions, 330
- Student climate strike in Belgium, 299
- Studies in the Sierra, 67
- Submarginal land, 148
- Summer water supplies, 146, 212, 259
- Sunrise Movement, 209, 235, 238
- Sustainability crisis, 296
- Sustainable future, 7
- Sustainable global society, 11
- Sustainable society, 306
- Sustainable traditional cultures, 245
- Svante Arrhenius, 98, 295
- Svante Thunberg, 295
- Swaminathan, M.S., 148
- Sweden, 315
- Take action for change, 242
- Taoist religion, 8
- Tarzan, 121
- Tax agreements, bilateral, 27
- Tax evasion, 198
- Tax of 70% on ultra-wealthy, 209
- Technology, transfer of, 160
- Television, 329
- Tell it like it is, 315
- Temperature and agriculture, 153
- Temperature increase, 211, 257
- The Annihilation of Nature, 135
- The Case for Optimism (TED), 285
- The Cassandra Conference, 134
- The Closing Circle, 141
- The Global Water Crisis, 253
- The Guardian, 207, 275, 286, 320
- The issue of water, 193
- The Jungle Book, 121
- The North-South Divide, 250
- The party is over, 329
- The Population Bomb, 133
- The rules have to be changed, 298, 328

- The Sea Around Us, 111
- The Shadow of Man, 127
- The Shock Doctrine, 232
- The Silent Spring, 113
- The Wind in the Willows, 107
- Theodore Roosevelt, 68
- Theory of heat, 92
- Thermohaline circulation, 219
- Thermonuclear war, 18, 333
- Thermonuclear weapons, 7
- Thirst for power and possessions, 198
- This Changes Everything, 232
- Thoreau's Journal, 56
- Thoreau's views on religion, 58
- Thou shalt not kill, 198
- Thunberg, Greta, 98, 295, 298, 299, 307, 315, 317, 328, 331
- Thunberg, Svante, 295
- Time Magazine, 142
- Tipping point, 310
- Tipping points and feedback, 219
- Tipping points, definition, 219
- Tolstoy, 56
- Tools of their tools, 58
- Top Gear, 289
- Topsoil, 156
- Topsoil, loss of, 151
- Total commodification, 256
- Tradition of sharing, 245
- Transportation, 152
- Tree-killing spree, 175
- Tree-cutting for firewood, 182
- Trees, destruction of, 151
- Triumphant denialism, 288
- Tropical cyclones, 211, 257
- Tropical rain forests, 17, 148
- Trump, Donald, 207, 235, 279, 310, 327
- Truthout, 320
- Turkey, 151
- Tyndall, John, 91, 100
- Typhoid fever, 161
- UN declares climate emergency, 320
- UN Secretary-General, 310
- Under the Sea Wind, 111
- Understatement of Existential Climate Risk, 321
- Unemployment, 161, 207, 209, 238
- Unequal distribution of incomes, 25
- Union of Concerned Scientists, 175, 327
- United Nations Environmental Program, 237
- United Nations Framework Convention, 321
- United States, 25, 147, 151
- Uniting for a Green New Deal, 235
- Unity of all life, 9
- Universal healthcare, 207
- Universal primary health care, 181
- University College, Leicester, 265
- University College, Nairobi, 169
- University of Leicester, 265
- University of Toronto, 232
- Unnecessary material goods, 55
- Unprecedented changes, 299
- Unquenchable, 256
- Unsustainable lifestyles in media, 289
- Urban growth, 157
- Urbanization, 151, 161
- Urgency of Green New Deal, 235
- Urgency of our situation, 310
- US Democratic Party, 207
- US Fish and Wildlife Service, 107
- US food system, 152
- US grain belt, 153
- USSR, 151
- Van Allen, James, 201
- Vapor pressure, 217
- Venice threatened, 215
- Vested-interest pressure, 323
- Viet Nam, 215
- Vietnam War, 231
- Walden, 55, 56, 61
- Wali, Mohan, 153
- Wangari Maathai, 169
- Waddell, David, 213

- Water as a human right, 252, 253
- Water availability, 151
- Water crisis of the planet today, 256
- Water erosion, 156
- Water resources, 154
- Water scarcity, 257
- Water stress per country, 259
- Water supplies, 151
- Water vapor, 92
- Water vapor a greenhouse gas, 217
- Water wars, 263
- Water Watch, 253
- Water, rapid run-off, 183
- Watering-down scientific findings, 323
- WCED, 152
- We have the facts and solutions, 297
- We have to change, 296
- We have to speak clearly, 317
- We live in a toxic system, 243
- We must act now, 309
- Wealth, 55
- West African monsoon loss, 212, 219, 258
- Western society, 245
- What about corporations?, 279
- What about governments, 279
- What Lies Beneath, 321
- Wheat farms, 151
- Wheat varieties, 148
- Why wasn't it made illegal?, 295
- Why were there no restrictions?, 295
- Widespread corruption, 198
- Wildfires in Sweden, 317
- Willful blindness, 330
- William Walton, 52
- Wind energy, 330
- Wind erosion, 151
- Winning slowly means losing, 288
- Wisdom of older societies, 245
- Women's rights, 172
- Women, education for, 161
- Women, higher status for, 161
- Work with poor slum-dwellers, 187
- World Bank press release, 215
- World Economic Forum survey, 324
- World market for food, 257
- World Meteorological Organization report, 309
- World's poorest three billion, 325
- Worldwatch Institute, 154
- Worship of power, 330
- Yields per hectare, 153
- Yosemite, 68, 78
- Young population, 161
- YouTube, 289
- Zeese, Kevin, 235
- Zutt. Johannes, 215