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HOW WAS THE MODERN WORLD CREATED?

Three forces have combined to accelerate the pace of change in the modern world. In this two-part video, David Christian describes how global exchange networks, competitive markets, and the increasing use of energy have transformed human societies and changed the biosphere. After watching these videos, you should be able to explain the effects of these changes and why, together, they represent a new major threshold of increasing complexity.

Key questions

- 1 What have been the positive and negative outcomes of accelerating change in the modern world?
- 2 Why does the modern era represent our eighth major threshold of increasing complexity?

Transcript: Part 1

In the last 100 years or so the revolutionary changes of recent centuries gathered momentum. They transformed human societies throughout the world, but they also turned us into the most powerful force for change in the biosphere. So much happened in this period that what we're going to do is take a bird's-eye view of some of the main events.

First of all, the three drivers of change that we already studied — global exchange networks, competitive markets, and increasing use of energy — began to operate with more and more power.

Global exchange networks became larger and larger and more and more dynamic. In the first half of the 20th century, conflicts between the major industrial powers led to devastating world wars — the first real world wars in human history — as they dragged their colonies into their fights. But in the second half of the century, international trade relations resumed to create the largest, most dynamic world market that's ever existed. Today, more goods, more people, more ideas, more money are being moved around the world than ever before in human history.

Industrialization went global, spreading to the east Asian tigers of South Korea, Hong Kong, and Taiwan, but also to the old superpowers of India and China. In fact, in the early 21st century the Chinese economy was probably the fastest growing in the world. The colonial empires of the 19th century were dismantled, creating new independent states.

0:11-0:50

THREE DRIVERS OF CHANGE

0:50-1:56

DRIVER 1: GLOBAL EXCHANGE NETWORKS

ASIA'S INDUSTRIALIZATION

1:56-2:42 In fact, by 2007 the United Nations — the body created as a sort of foundation for international governments in 1945 — contained 192 members.

THE INTERNET AND SPACE TRAVEL New technologies in communications and transportation accelerated the pace of change. The Internet provided instantaneous communication between millions of people all around the world. It also stored more information than you could have found in all the world's libraries just a century earlier.

As for transportation, think of this: In just 70 years we went from the first planes to a machine that could carry people to the Moon and back.

2:42-3:13 Governments were also transformed. In particular, as an increasing number of decisions had to be taken globally — such as decisions about global warming or the world economic crisis — the framework for such decision making was already beginning to appear in the United Nations and NGOs [nongovernmental organizations].

At the same time, governments built more and more sophisticated and complicated partnerships with their citizens as democratic methods of rule began to spread around the world.

The second great driver of change has been the spread of competitive markets and what's often known as capitalism. These forces now dominate the world economy. Let me give two illustrations of their meaning.

First, the modern world is no longer a world of peasants. Instead it's a world of wage earners. In addition, it's become a world of city dwellers.

Early in the 21st century, for the first time in human history more than 50 percent of humans lived in cities. Peasants were driven to the cities partly by employment opportunities, but also because new technologies — such as new forms of medicine, new forms of transportation, better sewer systems, the provision of electricity — made cities for the first time in human history healthier places to be in than villages.

The second great illustration of the power of competitive markets is the failure of the great 20th-century experiment with non-market societies, or communism.

By the 1990s everywhere in the world those societies were collapsing, and the reason for their collapse is precisely because they could not generate the innovation that market societies generated.

3:13-4:12

DRIVER 2:
COMPETITIVE
MARKETS

WAGE-EARNERS
MOVE TO CITIES

4:12-4:36

NON-MARKET
SOCIETIES FAIL

4:36-5:03

The third great driver of change was increasing use of energy. It's estimated that in the 20th century global consumption of energy increased by 16 times and most of it came from fossil fuels.

DRIVER 3:
INCREASING
ENERGY USAGE

In the early 21st century the use of fossil fuels is probably increasing, particularly as a result of the rapid industrialization of huge societies such as India and China.

Transcript: Part 2

As these global drivers of change gathered momentum, rates of innovation accelerated to unprecedented levels. I'd like to give some examples.

Let's begin with food production. In the 20th century, food production increased faster than population growth. This was a result of many new technologies — the creation of artificial fertilizers and pesticides, genetic modification of crops, and new forms of irrigation. But the remarkable result is that we have not yet seen a global Malthusian crisis, though there have been many devastating local and regional famines.

Total economic production increased in the 20th century by perhaps 14 times. According to some estimates industrial production increased by 40 times. As a result, there has emerged a growing global middle class whose living standards are rising very rapidly indeed. Millions of people continue to live in dire poverty, but many members of this growing middle class are enjoying living standards that even aristocrats could only have dreamed of in the agrarian era.

Meanwhile, life expectancies have doubled globally and educational levels are rising rapidly as a result of the spread of compulsory mass education. Early in the 21st century it's estimated that 80 percent of people over the age of 15 had basic literacy.

5:07-5:49

DRIVERS OF
CHANGE ACCELERATE
INNOVATION

5:49-6:58

ECONOMIC GROWTH
= GLOBAL MIDDLE
CLASS

RISING STANDARD
OF LIVING

In many areas, gender inequalities are diminishing as a result of changing family patterns and work patterns, though it remains true that women's income levels and educational levels lag behind those of men.

6:58-8:02

WEAPONS GROW MORE LETHAL

But of course not all innovations were positive. The killing power of human weapons has increased exponentially, from machine guns to poison gas to atomic weapons. Early in the 20th century, millions died during those devastating world wars.

In 1945 atomic weapons were dropped on the Japanese cities of Hiroshima and Nagasaki. Hundreds of thousands of people died within just a few days and many thousands more died over the next few years as a result of radiation sickness.

In October 1962, during the Cuban missile crisis, the world came within a hair's breadth of an all-out nuclear war. If it had happened its impact would have been as devastating as the asteroid that wiped out the dinosaurs 65 million years ago. That was a very, very close shave.

8:02-8:47

IMPACT ON BIOSPHERE

But the real significance of these changes will not become apparent until you see that they are transforming our relationship to the biosphere. If agriculture counted as an energy grab by one species, the modern revolution is a takeover of the entire biosphere.

A Dutch scientist, Paul Crutzen, has argued that since 1800 the Earth has entered an entirely new geological era, which he calls the Anthropocene. This is the era in which for the first time in 4 billion years a single species has become the dominant force for change in the biosphere, and that species of course is us.

Now, is he right? Well, his evidence is pretty compelling. Since 1900 human numbers have increased four times, human energy use by 16 times. According to some estimates, of all the energy that enters the biosphere through photosynthesis we are managing the use of between 25 and 50 percent.

Meanwhile, by burning fossil fuels we're transforming the atmosphere. We're pumping back into it carbon that was buried over hundreds of millions of years. Extinction rates are rising sharply as we takeover more and more of the biosphere; as we pave it over for roads and cities, as we clear forests for farmlands or timber, and as we divert rivers for irrigation. The result is other species are vanishing at a rate perhaps a thousand times as fast as would have been normal in the last few million years.

THE ANTHROPOCENE

8:47-9:46

POPULATION GROWTH & ENERGY USAGE

CARBON IN THE ATMOSPHERE

SPECIES VANISHING

9:46-11:11 We're also changing the chemistry of the biosphere. We're changing how nitrogen, sulfur, and carbon circulate. We've created perhaps 100,000 entirely new chemicals that never existed before in the form of plastics and rubbers, of fertilizers and pesticides, of synthetic textiles and drugs.

Finally, human weapons are now so powerful that in principle they could destroy much of the biosphere in just a few hours.

THRESHOLD 8: That is why we regard the revolutionary changes of recent centuries as the eighth major threshold of increasing complexity in this course. They have created something entirely new. A single global system that's more complex than anything we know of in the Universe and has the power to shape the fate of the entire biosphere. Think of the power of a species that can do these things. Will we use that power wisely or not? That will depend, at least in part, on your generation.