

India Today

Bhutan is a small country situated between India and China, which are major producers of carbon dioxide and yet, it has managed to achieve complete carbon neutrality in the past years. With a small population of 750,000 people, Bhutan is believed to be one of the greenest countries in the world. Practices such as planting trees in abundance and using electric vehicles have made this possible for a small nation like Bhutan.

A nation built on happiness

Unlike other countries, Bhutan has discarded the concept of making government policies on the basis of the Gross Domestic Product (GDP). Instead, they have based their decisions on the country's Gross National Happiness (GNH) index.

This concept has proved to be successful for Bhutan as 91 per cent of its citizens are narrowly, extensively or deeply happy, according to a 2015 survey.

Bhutan's Gross National Happiness index gives the natural world a central place in the making of public policy, and environmental protection is a core guiding principle in Bhutan's constitution.

The GNH of this nation plays an important role in the implementation of government policies which are based around four basic pillars, one of which is environmental conservation.

Carbon neutral nation becomes carbon negative nation

Earlier, Bhutan's Prime Minister Tshering Tobgay had the goal of making his country a carbon neutral zone. His main purpose was to make sure Bhutan doesn't contribute to the growing carbon dioxide released into the atmosphere.

His new policy of making his nation consist of minimum 60 per cent forest coverage was well received among citizens who have been planting trees excessively ever since.

With 72 per cent forest coverage in his nation, the overall carbon production has been nullified. Bhutan produces around 1.5 million tonnes of carbon every year but because of the immense greenery, more than 6 million tonnes of carbon is absorbed.

After the new government came to power, Bhutan's priority was to make the nation as environment-friendly as possible.

After the new government came to power, Bhutan's priority was to make the nation as environment-friendly as possible:

The launch of many new policies in 2009 made the carbon production decrease drastically.

An agreement was signed where it was stated that forest areas cannot fall below 60 per cent.

Along with this, the generation of hydroelectric power was promoted to decrease the burning of fossil fuels and there was a ban imposed on export water logging.

The government also teamed up with Nissan to distribute hundreds of electric cars among the citizen with a promise of thousands more to come. These cars were mainly distributed to discourage the use of vehicles running on fuel.

Apart from this, the government has also subsidized the rates of LED lights and electrical public transportation and lowered the rates on the purchase of electric vehicles.

The Clean Bhutan and Green Bhutan campaign has taken a lot of steps to beautify the country over the years.

The government has been taking steps to provide rural families with free electricity so that they don't have the need to burn wood in order to cook food.

The government has also decided to go paperless soon.

Valuing environment over economical growth

In a TED talk given by Tshering Tobgay, he had admitted that his nation is not perfect. He said that like every country, his Bhutan is not without problems.

Despite this, the uniqueness of Bhutan lies in the fact that the citizens and the government have made environment conservation their priority, rather than economical growth.

Buddhists hold trees very important in their religion which is the main reason why people there are so keen on planting them.

Around 100 volunteers in Bhutan set the world record for planting the most trees in an hour by planting 49,672 trees.

Guinness World Record Certificate presented to Bhutan for new world record with 100 men planting 49,672 trees in 1 hr pic.twitter.com/BXIQIpYHm Tenzing Lamsang

(@TenzingLamsang) [June 2, 2015](#)

What does the future hold for Bhutan?

With the constant rise in tree plantation and forest coverage in Bhutan, the government hopes that they maintain their position on the absorption of produced carbon.

The Bhutanese government has also predicted that they will produce 100 per cent organic food by the year 2020, they'll produce zero waste by the year 2030 and they'll produce zero net greenhouse gas and increase solar and wind energy availability.

Carbon production in the world

With the increase in technological advancements and mass production of packaged products, the carbon production from factories has increased by a huge percentage.

Because of this increase, the holes in the ozone layer have been expanding, allowing UV rays to reach the surface of the earth and causing major health issues.

The production of carbon has also led to the increase in the global air temperature and is leading the pollutants to cause respiratory and cardiovascular problems in humans.

Biology Online - Carrying Capacity

Carrying Capacity Definition

What is carrying capacity? In biology and environmental science, the carrying capacity of a biological **species** in a particular habitat refers to the maximum number of individuals (of that species) that the **environment** can carry and sustain, considering its geography or physical features.

In ecology, carrying capacity is measured as the maximum load of an environment. (Ref.1) The physical features present in the environment act as limiting factors (e.g. food, water, **competition**, etc.). Thus, the population limit can be expected to depend on these factors. In essence, food availability is an important variable as it affects the **population size** of the **species**. It does so in such a way that if food demand is not met over a given period of time the population size will eventually decrease until the resources become adequate. By contrast, when food supply exceeds demand then the population size will soon increase and will stop increasing when the source is consequently depleted.

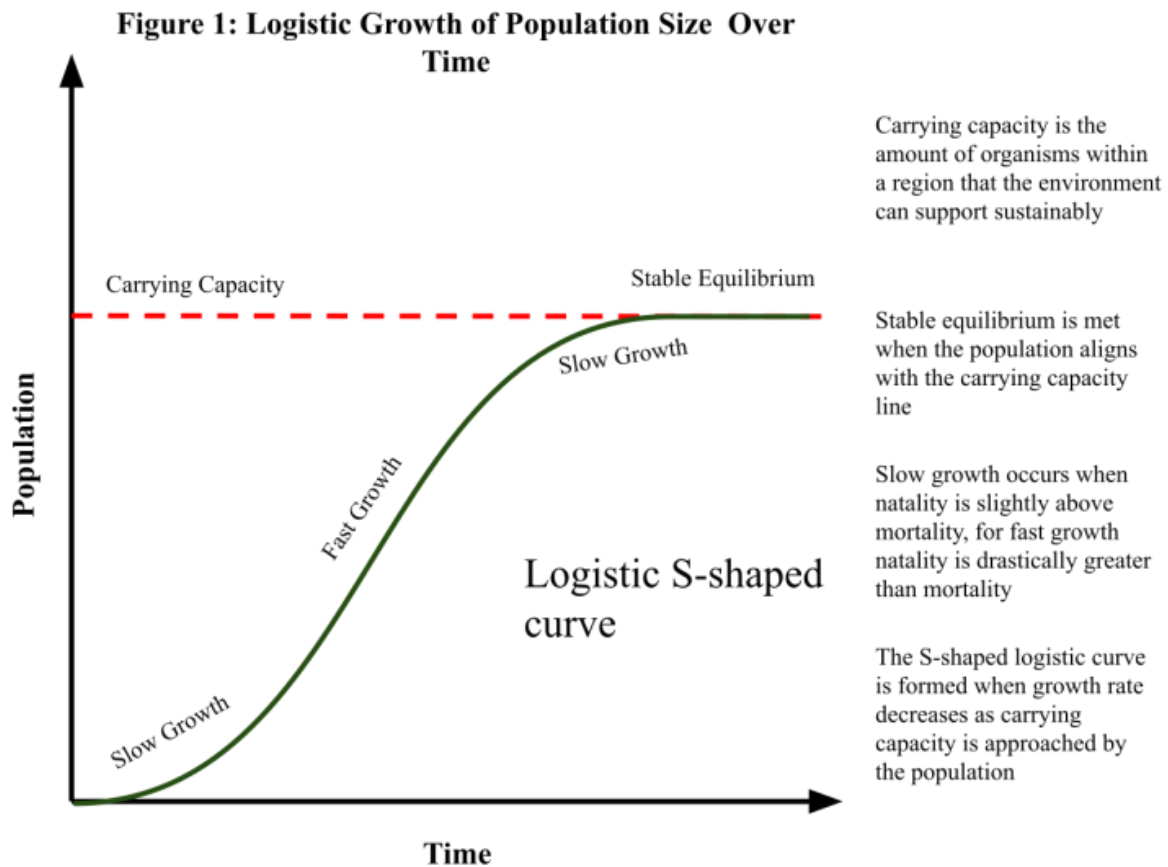
Carrying capacity may also be defined as the population size at which the population growth rate equals zero. (Ref.2) It should not be confused with the term, *equilibrium population*, which is defined as *a population in which the gene frequencies have reached an equilibrium between mutation pressure and selection pressure*. (Ref.3)

In archeology, carrying capacity pertains to the size and density of ancient populations as supported by a given region. (Ref.4) In this field of science, the maximum population over a particular period determines the carrying capacity of that environment. Studies on human history, though, provide evidence that the concept in which the human population size reaches the maximum level is relatively not that common. Most of the time, the **population density** of humans adjusts, especially as the actual food production fluctuates for that area or region. (Ref.4)

Carrying Capacity Graph

The picture below shows an example of a carrying capacity graph (Figure 1). Here, the carrying capacity (*symbol: K*) for a biological species is marked by the red dotted horizontal line to describe the number of organisms that the environment can support sustainably for a given time.

Notice that it coincides with the *stable equilibrium*, which refers to the population size that has reached a steady state as it aligns with the carrying capacity. This point indicates “zero-growth”. The growth is depicted as S-shaped (a characteristic of *logistic growth*). The S-shape logistic growth forms when the **growth rate** is slow at first (lag phase) and next speeds up (exponential phase). Then, the rate slows down again as the population size reaches carrying capacity.



Logistic growth showing carrying capacity graph. Population growth following an S-shaped graph. (Credit: Nchisick, CC BY-SA [4.0](#))

In the real world, though, population size tends to rise and dip in oscillations from the carrying capacity rather than a flat line as depicted in the graph.

To calculate the carrying capacity (K), the equation for the change in population size can be used for deriving a formula for K (Ref.5):

$$\frac{dN}{dt} = rN \left(\frac{1 - N}{K} \right)$$

population size

The formula for calculating a change in

$$K = \frac{rN((1 - N))}{\frac{dN}{dt}}$$

Carrying capacity formula

where r is the intrinsic rate of increase,

N is the population size,

and dN/dt is the change in population size.

A sample worksheet of carrying capacity and population biology can be found [here](#).

Carrying Capacity of an Ecosystem

Populations grow at a rate limited by the availability of the Earth's resources. A population may grow at a faster rate and follow a J-shaped curve. When the [birth rate](#) surpasses the [death rate](#) of the species, this results in *exponential growth*. However, this trend soon changes as resources become limited. The growth rate slows down.

Soon, it reaches a stable equilibrium where biomass in the given area seems unchanged over a certain period of time. At this point, the death rate appears to be compensated by the birth rate within a population. This means the *per capita birth rate* equals the *per capita death rate*. (Ref.2)

By contrast, when deaths appear to outgrow births, this indicates that the carrying capacity has been exceeded. This is a case of [overshoot](#). The population may go below the carrying capacity. This can occur, for instance, during [disease](#) and [parasitic](#) outbreaks.

Several factors affect the carrying capacity of an [ecosystem](#). These factors include food supply, water supply, habitat space, [competition](#) (intraspecific and interspecific), physical factors (e.g. extreme heat, drought, etc.), chemical factors (e.g. pH, mineral deficiency, etc.), and anthropogenic factors. The sum of these factors that end up restricting the biotic potential of a species is referred to as environmental resistance.

Carrying Capacity Examples

Turtle population

In nature, the population of a given area may reach carrying capacity when the maximum population size is reached for a given area with limited resources.

For example, a pond inhabited initially by ten turtles will be sustainable for the species' population. Because water, food, and space abound, the turtles can thrive and reproduce at

an exponential rate. However, as the population grows, competition is intensified as well. Turtles compete for food, water, and space.

Male turtles compete with other males for mates. These factors will limit the biotic potential of the turtles. When the population seems stable, e.g. at a population of 100 turtles, then, it can be said that the carrying capacity for that area is 100 turtles.

Forest population

Another example is the tree population in a **forest**. Let's say a forest can have a carrying capacity of about a hundred **trees**. This means that the trees can grow without fiercely competing for sunlight, nutrients, and space. This also implicates that the new sprouts may not be able to thrive in the same manner because the tall and older trees will cast a shadow over them, making sunlight hard to access from down below.

How Humans Change Carrying Capacity

Factors that Govern Changes in Carrying Capacity

Humans create sub-populations with different needs according to lifestyle. For example, some of them follow an **omnivorous** diet whereas others are strictly vegan. Because of this, the demand for food resources may vary. Humans have also found ways to solve and curb competition on resources, such as space, food, and water through technology.

For example, agriculture and husbandry helped expand the food supply. Humans learned to plant crops and breed animals to meet demands for food. They also learned eventually to build a safe shelter away from predators. However, certain modern technology and anthropogenic activities cause critical damage to the population of other species. Some forests and terrestrial habitats were cleared to build houses and establishments.

Pesticides intended for killing off pests from crops leached nutrients off the soil during rain and irrigation. Bodies of water became polluted because of improper waste disposal.

Nature has many factors that limit population growth. Thus, despite technological advancement to limit resource competition, the human population has to deal with other variables. Examples of such variables are sanitation, diseases, outbreaks, and medical care.

Ecological Footprint

Based on Earth's demographic facts and research study figures, the global carrying capacity for humans is estimated to be nine to ten billion people. (Ref.6) The world's population is nearly 8 billion.

How long can the Earth sustain the human population? Is it in the carrying capacity level or in the overshoot? The ecological footprint may be used as a basis for finding answers. It is a

measure of the human demand on nature using an ecological accounting system. On a global scale, it can help assess demand over what the planet can renew. And according to studies, the Earth has been in an *ecological overshoot*.

Humans use more resources as well as produce waste at a rate faster than the ecosystem can “heal” or renew. 85% of humanity lives in ecological-deficit countries — where the ecological footprint for consumption surpasses the biocapacity of those countries. (Ref.7)

7 demographic trends shaping the U.S. and the world in 2018

BY [ANTHONY CILLUFFO](#) AND [D’VERA COHN](#)

More than 2,000 demographers are in Denver this week for the [Population Association of America](#)’s annual meeting, where they will discuss topics ranging from the changing family to international migration flows. Ahead of the meeting, here are some important recent demographic findings from Pew Research Center:

1

Millennials are projected to outnumber Baby Boomers next year. [Numbering 71 million](#) in 2016, Millennials in the United States are approaching Baby Boomers (74 million) in population and are projected to surpass them as the nation’s largest living adult generation in 2019. The [Millennial generation](#), defined as Americans born from 1981 to 1996, corresponds to adults ages 22 to 37 in 2018.

Millennials are already the largest generation in the U.S. labor force, making up [35% of the total](#). (They surpassed Generation X in 2016.) Although Boomers formed the majority of the labor force in the early and mid-1980s, they made up just 25% of the total in 2017, as many older members of this generation reached retirement age.

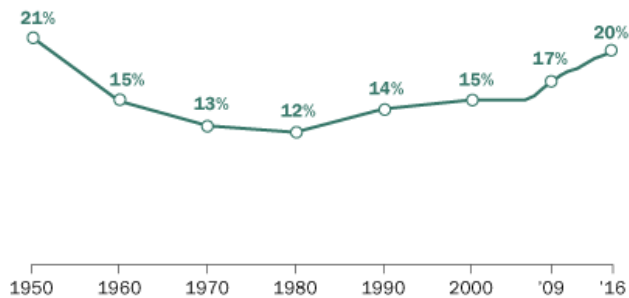
In the political arena, the number of [Millennials who are eligible to vote](#) in the U.S. is approaching that of Boomers. As of November 2016, Millennials formed 27% of the

voting-eligible population, while Boomers made up 31%. However, turnout rates in the 2016 election were lower for Millennials than Boomers (51% vs. 69%), meaning that Millennials accounted for a lower share of votes cast than their proportion of the electorate.

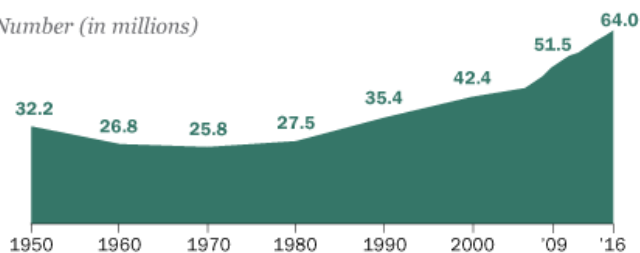
2

One-in-five Americans live in a multigenerational household

% of population in multigenerational households



Number (in millions)



Note: Multigenerational households include at least two adult generations or grandparents and grandchildren younger than 25.

Source: Pew Research Center analysis of 1950-2000 decennial censuses and 2006-2016 American Community Survey (IPUMS).

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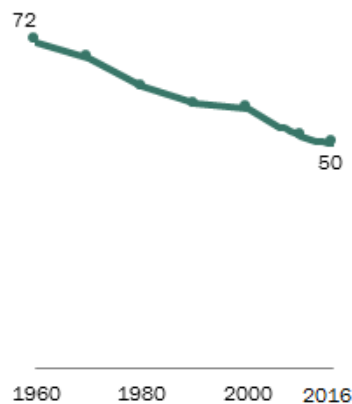
A record number of Americans live in multigenerational households, part of a broader trend toward more shared living. In 2016, a [record 64 million people](#), or 20% of the U.S. population, lived with multiple generations under one roof, even with improvements in the U.S. economy since the Great Recession. Multigenerational family living is growing among nearly all U.S. racial groups, Hispanics, most age groups and both men and women. In recent years, young adults have edged out older Americans as the most likely age group to

live in a multigenerational household, which we define as a household with two or more adult generations, or including grandparents and grandchildren younger than 25.

Meanwhile, [78.6 million adults](#), or about 32% of the U.S. adult population, were part of a shared household in 2017, reflecting another increasingly common living arrangement. A shared household is a household with at least one adult who is not the household head, the spouse or unmarried partner of the head, or an 18- to 24-year-old student. (Most multigenerational households are also shared households.)

Half of U.S. adults are married today

% of adults ages 18 and older who are married



Note: Data from 2013-2016 include individuals in same-sex marriages. Adults who are separated are not classified as married.

Source: Pew Research Center analysis of 1960-2000 decennial censuses, 2006-2015 American Community Surveys (IPUMS) and U.S. Census Bureau's 2016 American Community Survey 1-Year estimates.

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The institution of marriage continues to change. [Half of U.S. adults](#) today are married, a share that has remained relatively stable in recent years but is down significantly over previous decades. [Cohabitation among unmarried partners](#) is rising, including among a

[growing share of unmarried parents](#). The share of U.S. adults living *without* a spouse or partner [has also increased](#), from 39% in 2007 to 42% in 2017.

The educational gap in marital status continues to grow. In 2015, among adults ages 25 and older, 65% of those with a four-year college degree were married, compared with 55% of those with some college education and 50% of those with no education beyond high school. Twenty-five years earlier, the marriage rate was above 60% for each group.

The share of adults reporting they are married also [varies widely](#) across U.S. religious groups, according to Pew Research Center's [2014 Religious Landscape Study](#). For instance, six-in-ten or more Mormons, members of the Presbyterian Church (U.S.A.) and members of the Evangelical Lutheran Church in America are married, compared with fewer than four-in-ten atheists, agnostics and those who say their religion is “nothing in particular.”

Increasing shares of newlyweds have a spouse of a different race or ethnicity. In 2015, 17% of all U.S. newlyweds were [intermarried](#), a more than fivefold increase since 1967. Among cohabiting U.S. adults, [18% were living with a partner](#) of a different race or ethnicity. Patterns differ for racial and ethnic groups: Asians, for example, are more likely than whites to have a spouse or partner of a different race.

4

After decades of decline, motherhood and family size are [ticking up](#) in the U.S. Among women at the end of their childbearing years (ages 40 to 44), 86% had ever given birth by 2016, an increase from 80% in 2006 and about the same share as in the early 1990s. Women also are having more children: On average, women in 2016 had 2.07 children during their lives – up from 1.86 in 2006, the lowest average on record.

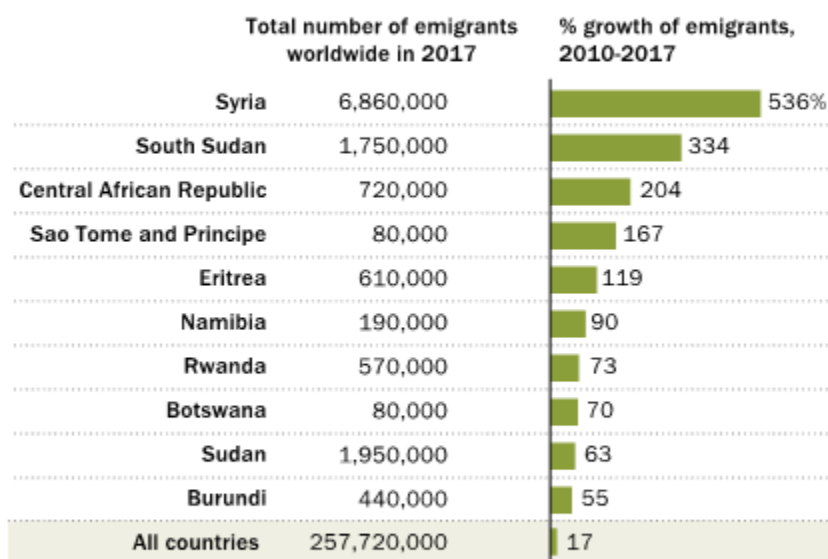
In addition, there has been a [substantial increase](#) in motherhood over the past two decades among women who have never been married. In 2014, more than half (55%) of women ages 40 to 44 who had never married had given birth – up from 31% in 1994.

Parenting is changing in America in other ways, too. Both fathers and mothers are spending [more time](#) caring for their children than in the past, even as mothers spend considerably more time working outside the home than they did in previous decades. For their part, [63% of fathers](#) say they spend too little time with their children, mainly because of work obligations, according to a Pew Research Center survey conducted in 2017. Mothers are far more likely to say that they spend the right amount of time with their kids.

5

Sub-Saharan African countries trailed only Syria in growth of emigrant populations worldwide, 2010-2017

People living outside their birth country (emigrants), by country of origin



Note: Syria is the only non-African country of the 10 nations whose emigrant populations worldwide grew fastest in 2010-2017.

Source: Pew Research Center analysis of United Nations data, accessed Dec. 23, 2017.

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There are more than 250 million migrants worldwide, according to the latest data from the United Nations on the number of people living outside their birth countries in 2017 (see this updated [interactive graphic](#)). Sub-Saharan African nations account for [eight of the 10 fastest growing](#) international migrant populations since 2010. The number of migrants

from each of these sub-Saharan countries grew by 50% or more between 2010 and 2017, significantly more than the 17% worldwide average over the same period. At least a [million sub-Saharan Africans](#) have moved to Europe since 2010. (Read this [new Pew Research Center report](#) for more information about the educational backgrounds of sub-Saharan African immigrants in Europe and the U.S.)

At the country level, Syria had the fastest-growing migrant population in the world, and Pew Research Center estimates that [six-in-ten](#) of the country's pre-conflict population is displaced.

6

New refugee arrivals are down in the U.S. and their religious composition has changed. The number of refugee arrivals in the U.S. [declined after 2016](#), even as the global refugee population increased. This decline was also widespread across the U.S., with declines in [46 states](#) during the beginning part of fiscal 2017 (which began in October 2016).

Furthermore, since 2016, the share of refugees who are Christian has risen, while the share who are Muslim has declined, according to a [Pew Research Center](#) analysis of U.S. State Department data.

Most refugees coming to the U.S. as of the end of fiscal 2017 were from the [Middle East and Africa](#), although this has not always been the case. In fiscal 2002, Ukraine and Bosnia and Herzegovina accounted for the two largest countries by number of refugees coming to the U.S. And between fiscal 2008 and 2012, more than four-in-ten refugees admitted to the U.S. were from Asian countries.

7

International arrivals to the U.S. have risen among some groups. New [foreign student](#) enrollment at U.S. colleges and universities doubled between 2008 and 2016, from 179,000 to 364,000, far outpacing growth in overall college enrollment. Growth has been stronger at

public schools than private schools. Students from China, India and South Korea accounted for [more than half](#) (54%) of all new foreign students pursuing higher education degrees in the U.S. in 2016.

In recent years, there also has been a rise in immigrants to the U.S. from [El Salvador](#), [Guatemala and Honduras](#), whose numbers rose by 25% from 2007 to 2015. The U.S. [black immigrant population](#), though small, also is growing: There were 4.2 million black immigrants living in the U.S. in 2016, up fivefold since 1980.

Once arrived, rising shares of immigrants have become citizens, and [naturalization rates are up](#) among most of the largest immigrant groups. The number of naturalized immigrants grew from 14.4 million in 2005 to 19.8 million in 2015. Among origin countries, Ecuador and India had the largest increases.

Another aspect of the immigrant experience, according to a Pew Research Center survey, is that people are [less likely to identify themselves as Hispanic](#) the more generations they are from their immigrant roots. Among U.S.-born children with Hispanic ancestry and at least one immigrant parent, 92% identify as Hispanic. But among the next generation, that falls to 77%.

Human Population Through Time

Human Population

Modern humans evolved in Africa about 200,000 years ago.

About 100,000 years ago, we began migrating across the globe.

Our population remained low—probably less than 1 million people.

With the advent of farming, growth picked up.

By AD 1, world population reached approximately 170 million people.

Year: AD 1 Human Population: 170 m

Dot = 1 million people

Han Dynasty

Roman Empire

Human population: 177 m

Silk Road

Year: 300 AD

Human population: 180 m

Golden Age of India

Year: 500 AD

Human population: 177 m

Peak Mayan Civilization

Year: 600 AD

Human population: 181 m

Birth of Islam

Year: 750 AD Human Population: 195 m

Smallpox in Japan

Year: 850 AD Human population: 215m

Gunpowder invented

Year: 1050 AD Human population: 283 m

Navigational compass

Year: 1200 AD Human population: 362 m

Mongol Empire

Year: 1350 Human population: 364 m

Bubonic plague Rare decline in world population

Year: 1490 AD Human population: 405 m

Europeans arrive

Year: 1520 AD Human population: 456 m

Transatlantic slave trade

Year: 1740 Human population: 714 m

Industrial Revolution Modern technology and medicine bring faster growth

Year: 1910 Human population: 1.7 b

World Wars

Year: 2015 Human population: 7.4 b

Year: 2050 Human population (projected): 9.5 b

LEVELING OFF

If current trends continue, global populations will peak at 11 billion around 2100.

Growth is slowing because average fertility rates are falling in nearly every country.

1950: 5 babies/woman

2100: 2 babies/woman

If fertility forecasts are slightly off, our peak population will peak lower...

...or higher.

It took 200,000 years for our population to reach 1 billion.

And only 200 years to reach 7 billion.

As our population has grown, so has our use of Earth's resources.

Choices we make today

family planning

reduced consumption

pollution controls

habitat protection

Choices we make today affect the future of our species—and all life on Earth

World in the Balance: The People Paradox

OLIVER PLATT In the elementary school of Oguchi, Japan, the silence is more striking than the voices of children. In a spacious classroom, commanding the undivided attention of his teacher, 11-year-old Daiki Sato sits alone. Since kindergarten, he's been the only student in his class, because of a startling decline in birth rates. By the end of the century, Japan's population is expected to shrink by half, with one out of every three people retired. And Japan is not alone. Over the next 50 years, Europe is projected to lose 63 million people, while Russia shrinks

almost 20%. As elders over 60 outnumber children under four, the economic and social changes will be wrenching.

PAUL HEWITT We're talking about a society in the future that's never existed in the past, one that is, you know, literally an old folk's home. So we know that the decline of many industrialized countries is already written in stone.

OLIVER PLATT Yet, rising longevity is not just transforming the industrialized world. More children in developing countries are surviving than ever before. Today, the largest generation of youth in history is entering their reproductive years, igniting an explosion of births. As global population climbs from over six to nine billion, the social and environmental strains will be enormous. Our world is now careening in two completely different directions as youthful nations reel from rising numbers while old ones grapple with decline.

DAVID BLOOM You see a huge generation gap across countries emerging, that's going to translate into a more polarized world society, and those disparities are potentially very destabilizing.

OLIVER PLATT Join us for a journey across four continents as we peer into the demographic divide reshaping our world and confronting us with stark choices for the future. World in the Balance: The People Paradox, up next on NOVA.

NOVA PARK FOUNDATION

UNKNOWN Major funding for NOVA is provided by the Park Foundation, dedicated to education and quality television.

Sprint® The Clear Alternative to Cellular.

UNKNOWN Science: it's given us the framework to help make wireless communications clear.
Sprint is proud to support NOVA.

Microsoft Your potential. Our passion. Microsoft

UNKNOWN We see an inventor. At Microsoft, your potential inspires us to create software that helps you reach it. Your potential, our passion.

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World in the Balance The People Paradox Narrated by Oliver Platt Written, Produced and
Directed by Sarah Holt www.pbs.org human numbers through time

OLIVER PLATT Deep in the heart of India, towers the Taj Mahal, a lavish mausoleum built to
honor a queen who died giving birth to her 14th child. It's a haunting symbol for a country that
will soon surpass China as the world's most populous nation, with over a billion and a half
people. Beyond its walls, lies the urban sprawl of India's fastest growing state, Uttar Pradesh,
with more people than all but four nations in the world. Its population of 177 million is crammed
into an area the size of Colorado. Every three years, its numbers swell by another ten million. Yet
the rapid growth here masks a stunning success across India, where fertility has plummeted from
an average of six children per woman to three. This trend offers hope that India's population

might stop growing this century. But the outcome depends on whether the northern states can repeat the success of the south where birth rates are almost as low as Europe's.

NOVA CARL HAUB Population Reference Bureau

CARL HAUB And the south of India, of course, is very educated. However, the opposite is the case in the north, and that's where India's demographic future really lies. In a state like Uttar Pradesh, where women average about five children each in their lifetime, ah, and they have very high levels of illiteracy, this is where the real battle for India's future is going to be fought.

OLIVER PLATT If this battle isn't won within two decades, India's population, instead of stabilizing, could nearly double by 2050. With U.S support, Dr. Ravi Anand has organized a network of doctors across Uttar Pradesh to offer health care and family planning.

NOVA DR. RAVI ANAND Ctr. for Dev't and Population Activities

DR. RAVI ANAND I would say this is our window of opportunity. If we do not take all the measures that we can, in every possible manner, to check the population now, then India will never be able to tackle this problem.

OLIVER PLATT Yet Ravi is well aware that if progress is going to be made, the lives of women here must improve. In a nearby slum, she checks on a 30-year-old mother named Gooday, who almost died delivering her eighth child. She was rushed to the hospital unconscious, after three days of obstructed labor.

DR. RAVI ANAND So, now tell me, I hear you had great problems with this birth?

GOODAY Terrible problems. The midwife that had delivered my other babies came, but when she touched my belly she said, "This baby's life is in danger. You must find the money to get to the hospital."

OLIVER PLATT After delivering a baby girl, Gooday begged doctors to be sterilized, but she was overruled by her mother-in-law and husband.

DR. RAVI ANAND She says she's petrified of another pregnancy and childbirth, and she doesn't want to have another baby. But she's the one who's least involved in this decision making. And that is why we counsel the husband and the mother-in-law, because we call them the gatekeepers to the health services.

DR. RAVI ANAND So, I hear you want a second son?

UNKNOWN I need at least one more.

DR. RAVI ANAND You have only one son? And isn't one son good enough for you?

UNKNOWN He's 40 years old, and he is the only son left alive.

DR. RAVI ANAND And daughters?

UNKNOWN I have three daughters, but they've gone to live with their husband's families.

DR. RAVI ANAND Listen, today, one son is just as much as you may need.

DR. RAVI ANAND One of the major reasons for the family size to be really large in northern India is the son preference, because it's the son who stays with the family, and he's expected to look after his old parents. And girls are always considered as, somebody else's asset, not mine.

NOVA ASHISH BOSE Institute of Economic Growth

ASHISH BOSE But the point is the strategy of survival demands that you must have one or two sons, otherwise you will be left high and dry, not only in the old age, throughout your life.

OLIVER PLATT Having a second son raises the odds for Gooday that at least one boy will survive, especially since one in 10 children in Uttar Pradesh dies before age five. Gooday has lost three infants. Ravi urges her to bring her children to the clinic for vaccinations. If the family trusts their son will survive, the pressure to bear another may ease.

NOVA SAROJ PACHURI Population Council

SAROJ PACHURI Women in India really don't have control over their reproductive lives because all sexual reproductive health decisions are essentially made by men. And so you can't deal with an issue like population by itself. You have to look at the issue of infant mortality, literacy, or women's status, because it's all very interlinked. This is a patriarchal society. And I think gender lies at the heart of the problem, really.

OLIVER PLATT On the edge of the Deccan plains, barefoot children walk towards their school in the rural village of Saswad. The daily rhythm of life here masks an unusual event unfolding in the heart of the village. Newly married couples play games to get to know each other as they wait to have their wedding portraits taken. The gathering has been organized by social worker Manisha Gupta to help young men and women bridge India's stark gender divide.

NOVA MANISHA GUPTA MASUM

MANISHA GUPTA In a traditional Indian society, 95% of marriages still are arranged marriages. And most often than not, the bride and the groom are strangers to each other. And one would say that there's a 50% chance of things going wrong in a rural marriage where it's arranged, and she's barely 15 or 16, and he's not much older. And we're talking of, really, adolescents, you know, who, who are building a life and having children. It's not an easy job.

OLIVER PLATT Social taboos pushed aside, girl and boys in separate groups hear frank talk about sex and how to use birth control. The stakes are enormous. The age structure of India's population resembles a pyramid, with vast numbers of youth at its base. Half the country, mirroring the world at large, is under 25 and reaching reproductive age.

India's Population Pyramid Over Under 25

OLIVER PLATT If couples in this generation have only two children, in effect replacing themselves, population growth will soon halt. Yet for Manisha, it's far from clear if India's youth will follow this radical trend and throw off the shackles of tradition. As they pose for their portraits, she asks them how many children they want, if the gender matters, and how they feel about birth control.

MANISHA GUPTA A lot of the couples said that they'd be happy with two children. And we said, "What gender?" And they said it doesn't matter. It's very nice of them to say it. Ten years ago our people wouldn't have even said it. But I'm not really sure what would happen in the household if there were just two daughters.

OLIVER PLATT Daughters are seen as an economic liability because parents must provide a dowry of cash or gifts to marry them off. A common Hindu wedding blessing prays that a wife will bear eight sons, but if she doesn't have any, there could be a price to pay. And that's why Manisha tries to intervene early.

NARRATOR The most shocking proof of what can go wrong are the brides who've been doused in kerosene and set ablaze by angry in-laws or husbands. An estimated 25,000 women are killed or maimed each year over dowry and domestic disputes or even their failure to produce a son.

MANISHA GUPTA Bride burning is common in India. And since women are so dispensable, and these young, little girls, you know, between the ages of 15 to 24 are the most vulnerable, girls will get burned, they will get poisoned. And so, therefore, a girl in the husband's house, at least for the first ten or 15 years, always walks on a tightrope.

OLIVER PLATT Gender discrimination takes place even among the wealthy. Upper class parents, committed to a two-child family, have sonograms to make sure that they've conceived a son. Although this doctor refuses to reveal a fetus's sex, not everyone is as ethical. Millions of females are aborted, leaving India with 35 million fewer women than men.

MANISHA GUPTA There was an article saying that better dead than burnt, okay, meaning that it's better that you have sex determination rather than be burned in your in-laws' household. And the newspaper asked me to write a rejoinder, and I wrote a rejoinder saying, neither dead nor burnt.

CARL HAUB India wants to reduce population growth, but it certainly doesn't want to reduce it through sex-selective abortion. In fact, it is actually illegal now to test to see what the gender of a fetus is. But I think the single most important thing India can do today, demographically, is to somehow make the birth of a girl child as welcome as the birth of a boy child, because the goal of most developing countries is to reach this magical two-child family.

OLIVER PLATT Abidi Shah, a social worker, has seen that when women have greater access to education and job training, their status rises. Sixteen years ago, she visited a village on the outskirts of New Delhi. Dismayed by the plight of young girls there, she decided to act.

ABIDI SHAH There wasn't any sense among the girls of the adolescence, because they had lost their childhood already. They had to look after their younger brother and sister. They had to cook the food. They had to clean the house. They had to fetch the drinking water. No education for them, no food for them, no clothing for them.

OLIVER PLATT First Abidi had to convince a skeptical community to let her teach vocational and health classes to adolescent girls. Next, she had to show the girls themselves how education could improve their lives.

NOVA ABIDI SHAH PRERANA - Better Life Program

ABIDI SHAH I just said, "Do you want same life as you are living here?" They said, "No, I want better life." "What sort of life do you want?" "The life I see on the TV. The life you are living." So I said, "Then what will you do?" "We can't do anything. That's our luck, that's our destiny." I said, "No. This is not your destiny. You can change your life."

OLIVER PLATT One young woman who attended the program was Bimla. At age 13, her father had arranged her marriage and forced her to drop out of school.

BIMLA I already had two daughters when Abidi arrived at our house. She saw that I was hungry and exhausted, and she asked me, "Why don't you use birth control?" I didn't know anything about it. But I knew I didn't want any more children.

OLIVER PLATT Bimla was just the kind of girl Abidi wanted to reach. She told Bimla that she could legally use the pill, even without her family's permission.

BIMLA I was talking with my friend, and my mother-in-law was listening from behind the door. As soon as she left, my mother-in-law started yelling, "You must have a son. Stop taking the pills." Although she tried to beat me into submission, I was sure I didn't want any more children. I could see that large families were often poorer. Their children didn't have clothes to wear, or food to eat that they played in dirt and they didn't get an education.

OLIVER PLATT With help from Abidi, Bimla learned tailoring. Soon she had enough money help her husband buy a new house and send their children to school.

NOVA GEETA RAO GUPTA Int'l Ctr for Research on Women

GEETA RAO GUPTA The reality, in India, is that many, many women are very empowered, but the majority are disempowered. So when women want to change the way their roles are defined, they cannot do that if they're economically vulnerable and dependent, because the price then is that if you are left destitute, if you're abandoned, if you're thrown out of the house, you have no way to survive if you have no income. So I strongly believe that one way forward, to increase the momentum of social and cultural change, is to allow women to have employment opportunities.

OLIVER PLATT Yet these opportunities may be hard to come by, even as change sweeps across India. To keep pace with its growing population, the country must create six million new jobs a

year. But even its dazzling economic growth of eight percent is not enough to prevent unemployment, already widespread, from rising. And a new problem is looming as population pressures confront a vast number of towns and villages with chronic water shortages.

NOVA LESTER BROWN Earth Policy Institute

LESTER BROWN In India, water tables are now falling in most states, including the Punjab, which is the bread basket of India. And this is making it more difficult to expand food production at a time when the population is projected to grow by another half billion by 2050.

NOVA ALLEN HAMMOND World Resources Institute

ALLEN HAMMOND India faces really huge environmental problems from rapid population growth, and it might have a hard time growing enough food for itself. On the other hand, it's becoming a center of software, so if it makes a transition to becoming more of a high tech, knowledge-based society, then it probably could feed itself. It has huge numbers of very smart, well educated people.

ASHISH BOSE So we have got such a large number of intellectuals in every field that you cannot write off India and say, "Oh, population growth will finish this country. We'll be doomed. There'll be no drinking water, no housing, no nothing, no jobs." Absolutely unreal, unscientific, it is drama.

OLIVER PLATT India is poised on a knife edge. Headed in the right direction, it will still take years to reach the coveted two-child family. And what if the average family size turns out to be slightly more?

NOVA CAROL HAUB Population Reference Bureau

CAROL HAUB Suppose in India they really did achieve two children per couple in, let's say, 15 years. Then they would rise to about 1.6 billion by 2050. But the key is, if couples have, on average, about two and a half children, India would get its second billion by the middle of this century.

OLIVER PLATT And the same is true for the world. If global fertility stays even slightly above this magical two-child number, by mid-century our population could nearly double, from six to 11 billion.

NOVA DAVID BLOOM Harvard School of Public Health

DAVID BLOOM We're dealing with unprecedented numbers, in terms of their magnitude. The result could be huge rates of unemployment, ah, great political instability, strife, and a complete unraveling of economy and society. And human ingenuity may well find a way to deal with these numbers it has in the past human ingenuity is wonderful, but it's also, like demographics, highly uncertain.

OLIVER PLATT Around the world, in Japan, the population is careening in the opposite direction of India's. Three hundred children once studied here, in the elementary school of Oguchi. But once this lone fifth grader graduates, no new students will fill his place, because of a startling decline in birth rates.

NOVA BEN WATTENBERG American Enterprise Institute

BEN WATTENBERG Never before in human history has fertility fallen so far, so fast, so deep and so unexpectedly. And no one should doubt that it is a revolutionary change.

NOVA PAUL HEWITT Social Security Administration www.pbs.org more of this interview

PAUL HEWITT If you go back and you look at the 1960s, there are all these horrendous titles of books, like *The Population Bomb*, but many more. And you find out that the primary source of concern in intellectual circles about population was, and in some places continues to be, the population explosion. And in all of the industrial countries, our overreaction, potentially, uhm, to this, this concern now has left us with just the opposite problem.

OLIVER PLATT With crowded streets and packed trains, Japan hardly seems to be in need of any more people. But if fertility stays at its low rate of 1.3 children per woman, by the end of the century, Japan's population of 126 million, will shrink in half. The impending decline has become a national crisis, with blame targeted against the soaring numbers of unmarried youth. Called parasite singles, they live with their parents while pursuing careers and other interests besides marriage.

NOVA MERRY WHITE Anthropologist, Boston University

MERRY WHITE Japanese women in the '70s felt that 25 was your last chance to marry. If you were 26, you'd be a Christmas cake, because December 25 is the last day when a Christmas cake can be sold, ah, and after that, you're leftovers. Now, a woman will often delay marriage until the last possible time before she can have her first child. This is now seen by some as a kind of female selfishness. But I think women in general are trying to do different things with their lives.

OLIVER PLATT Tomoko Omura is a leading television journalist. At age 29, she became one of Japan's first female anchors.

TOMOKO OMURA I think there are two doors for women. One door has a ladder for promotion, and the other one doesn't really have anything, and you just stay on the same level forever. And lots of women end up taking copies and serving tea. And I didn't want to have that kind of work, and I was looking for a good lifetime career.

OLIVER PLATT By age 37, Tomoko had become an editor-in-chief, supervising a team of producers and reporters. Her husband of nine years often asked her when they might start a family.

TOMOKO OMURA Many companies in Japan still consider women with children as burden. So, I was so scared to have a baby, because I thought I would just drop out of the race. So, I kept on just postponing it. But when I turned 37 or so, I started feeling like, uhm, I don't know something was missing in my life.

OLIVER PLATT At 41, Tomoko gave birth to their daughter, Asumi. Her initial ambivalence about motherhood is becoming increasingly common.

UNKNOWN When I get married, it might be better to have kids, but I don't worry about it.

UNKNOWN If I get married, I might think about having kids in my 30s.

UNKNOWN If I am working, I can live on my own. In the older times, marrying, for Japanese women, was like a dependency. It's not like that anymore.

OLIVER PLATT But besides wanting careers, there's another crucial reason that more women are working.

MERRY WHITE In Japan, the economy since '89, '90 has been in a recession. Japanese women often have to work to keep their families middle class. One income doesn't work for many families, especially in terms of the costs of children's education. It's an exceptionally expensive task to raise a successful child in Japan.

OLIVER PLATT There's a saying that Japanese men live at the office and commute to home, often catching the last train at midnight. Now as more women join their husband's at work, they're discovering that the long hours required by most employers make having a family, certainly a large one, difficult. For Tomoko, it was a tough challenge to find a daycare center that could look after Asumi for 13 hours a day, given the unpredictable hours of the newsroom. For six months, her mother moved to Tokyo to help. Now that she's gone, Tomoko agonizes at the thought that her daughter may be asleep by the time she's picked up.

TOMOKO OMURA If you are an executive, you can't say, "Well, it's five o'clock, I'm leaving." If there's work, you have to complete your work. Right now I'm trying to figure out how to work with my full ability, and at the same time just save the time for my baby. My husband, I know he's busy, maybe busier than I am. Japanese people tend to work for long hours and unless we change that kind of idea, the declining birth rate is going to continue.

OLIVER PLATT Three hours from Tokyo, near the elementary school of Oguchi, one can glimpse the flip side of the country's falling birthrates. By 2050, one in three Japanese will be over the age of 65. In Oguchi, this is already the reality. Mr. and Mrs. Ohno's house was once packed with three generations. But since their parents died and their children left for careers in the city, life for this 80-year-old couple has become lonelier.

NOVA MRS. OHNO

MRS. OHNO In the old times, it was normal for a daughter-in-law to look after her in-laws. So that's why I took care of my father-in-law until he died, at 83.

NOVA MR. OHNO

MR. OHNO Our children have grown up and gone to live in Tokyo. They've all gotten married and have to worry about sending their children to school. That is their place now. They have to work, and they can't afford to come back here and look after us.

MERRY WHITE The governmental query now is, "Who cares for our elders?" In essence, though, the government really feels that families are responsible and society isn't. And ultimately, when you say family, you mean women.

OLIVER PLATT But with more women working, there's often no one at home to care for the elderly. The stress on families is mounting, especially since neither the government nor private industry has been able to fill the gap. If the Ohnos should get sick, the only nearby nursing home is full. To ensure their security in old age, the Ohnos had counted on profits from their forest, but as globalization brought in cheap timber from the Philippines, they were unable to sell their trees.

00:32:05

MR. OHNO I can't depend on my children, so I don't know what to do. It would be great if the government builds lots of nursing homes and takes care of us, but I don't have high expectations. Staying healthy is the best thing, but we can't stay healthy forever.

Japan's Population Pyramid Over 60 Under 25

OLIVER PLATT Japan's population pyramid looks like India's turned upside down, reflecting how the elderly dramatically outnumber the young. The Japanese now live longer than anyone else, with men averaging 78 years and women 84.

NOVA JOEL COHEN Rockefeller & Columbia Universities

JOEL COHEN And with increasing education, we find that disability rates among the elderly have been dropping steadily. That is fabulously good news. It's a revolution in human demography. It means that people of 60 have the function of people of 40 at the beginning of the century.

OLIVER PLATT But this good news is tempered by a sobering reality in aging countries. There will soon not be enough young people entering the work force to support those retiring. Not only will there be fewer workers, but as the population declines, there will be fewer consumers.

PAUL HEWITT It's going to be extremely hard for businesses to make a profit. And when businesses don't make a profit, they don't pay taxes. And when taxes don't get paid, you can't support the welfare state. And so the older countries face such a huge problem financially that they really could undermine the global economy.

OLIVER PLATT To keep its workforce from shrinking, an aging country like Japan would need to take in 600,000 immigrants a year. Yet the Japanese resist, obsessed by preserving their own ethnicity. In stark contrast, America's workforce continues to grow as a result of immigration.

BEN WATTENBERG American fertility has been below replacement for about 35 years, but just barely below. But we take in about a million immigrants a year. And in the next 50 years, they and their children are going to help America grow by about a 100 million people, so we will be the only one of the modern countries that will be growing, and growing substantially.

OLIVER PLATT The United States is now the third most populous nation, and will remain so for the next 50 years, as our numbers climb from around 300 to 400 million people. Economically, this growth keeps us vibrant. Yet our productive economy also uses more resources than any other nation and generates one quarter of the greenhouse gases contributing to global warming. In fact an American child will consume and pollute more over a lifetime than 30 children born in India. Although population growth is delaying aging in the U.S., our ranks of seniors will also increase as the baby boom generation, one in four Americans, retires.

NOVA PAUL HEWITT Social Security Administration

PAUL HEWITT No other country will see as large a percentage increase in the elder population as the United States will, because our baby boom was larger than anybody else's. And yet we will continue to have lots and lots of young people to support them not enough to keep Social

Security solvent, but certainly enough to make us a younger country compared to the other developed countries.

OLIVER PLATT Across the industrialized world, the average family size is now at or below two children. This stunning change has slowed population growth, yet it also signals the advent of global aging. Confronted by the prospect of shrinking populations, many countries now encourage couples to have more children. Ironically, they're finding that it maybe easier to cut fertility than it is to raise it.

OLIVER PLATT A startling demographic divide now confronts us as older societies shrink and age, while youthful ones reel from rapid growth. Nowhere is the contrast starker than in sub-Saharan Africa. With families averaging around six children each, it's one of the fastest growing regions in the world, despite high death rates from AIDS.

NOVA DAVID BLOOM Harvard School of Public Health

DAVID BLOOM AIDS mortality is having a huge effect on population size. Nevertheless, the age structure in sub-Saharan Africa is so young that there will be so many people that still need to pass thorough their reproductive ages, that sub-Saharan Africa, even if it put the brakes absolutely, today, on fertility rates, its population would nearly double over this century.

OLIVER PLATT In 1950, sub-Saharan Africa had one third as many people as Europe. By 2050, this African population will be triple the size of Europe's.

NOVA THORAYA OBAID U.N. Fund for Population

THORAYA OBAID Rapid population growth poses a real challenge to nations. It taxes their educational system, their infrastructures, their health system, so, as a whole, it becomes a heavy burden on an economy and a governmental system that is not strong enough.

PAUL HEWITT And what does it mean for these countries? It means falling per capita incomes, it means deteriorating social services, and it means conflict. And these will create tremendous pressures to emigrate.

OLIVER PLATT Africa's population pressures will not just create economic refugees, but environmental ones as well. To meet rising demands for food, fuel and shelter, the continent's forests are disappearing at the fastest rate in the world. As countries struggle to obtain a decent standard of living, natural environments are increasingly strained. The degradation not only threatens Africa's unique wildlife, but creates hardships for people who live off the land.

NOVA ALLEN HAMMOND World Resources Institute

ALLEN HAMMOND And roughly a third of the people in the world still earn their living not on a job, but by growing things or catching them, or by picking them up off the ground. So if those ecosystems go down, those people are in very bad shape. And so that's the real risk, is that we're going to degrade ecosystems past the point where they can sustain life as we know it.

OLIVER PLATT Many African states have now embraced family planning. One of the oldest and most successful programs is in Kenya. In the '70s and '80s, this east African nation was the poster child for runaway growth. But two decades of family planning cut fertility from around seven to four children per woman.

JOEL COHEN The number of children per woman has dropped dramatically, partly as a result of their individual choices, and partly because people have thought to provide reproductive health services to make it possible for them.

OLIVER PLATT According to demographic models, Kenya's falling fertility places it on the threshold of a profound transition. All countries start in stage one, where high death rates from disease make high birth rates a necessity to keep a population from being decimated.

NOVA LESTER BROWN Earth Policy Institute Birth Rates Death Rates Population Explosion

LESTER BROWN But then, as modernization begins, the death rate falls but the birth rate does not. And so you have a large excess of births over deaths, and the so-called population explosion.

OLIVER PLATT The challenge for every country is to pass rapidly through this second stage, and bring birth rates back into balance with death rates, allowing the population to stabilize.

LESTER BROWN Because if countries can't get through that stage quickly, then the pressures of population growth may begin to undermine their prospects of breaking out. And if they don't break out, then the chances are that, eventually, things will start breaking down.

PBS NOVA

OLIVER PLATT Just as Kenya stands ready to reap the benefits of falling birth rates, the country is facing a stunning demographic reversal. For the first time in modern history, death rates are rising not falling. Six to nine percent of all Kenyans are infected with HIV-AIDS, causing life expectancy to plummet from 65 to 49 years. In Kenya, AIDS and population growth have become tragically linked. Nowhere is this more evident than in the slums of Nairobi. Here, 21-year-old Florence Akinyi lives with her relatives in a one-room corrugated shack. What's surprising about her family is that all six members are orphans. At 16, Florence was thrust into taking care of her four younger siblings after their parents died of AIDS. Then the disease killed her sister, and Florence took in her three-year-old nephew.

FLORENCE AKINYI In fact, at times I always feel that it is a lot of burden, but because I knew there is no one to take care of them, I have just to do the duty now.

OLIVER PLATT Florence dropped out of school and searched for ways to support her family. But with few skills, her options were bleak.

NOVA PAMELA ONDUSO Pathfinder International

PAMELA ONDUSO What happens with these young women when they are forced to drop out of school, very often with very basic elementary education, they wind up on the streets. And they

sell their bodies in order to fend for themselves. It is not uncommon to find that young women have had sex with older men for something as simple as meal, for something as simple as a bag of what we call chips.

FLORENCE AKINYI I always feel so bad because in order to get money, from this, that is, you have to sleep with them, and they pay you more when you don't use the condom. And I needed money to survive.

Population Pyramid Ravaged by AIDS Age 60 Age 20

OLIVER PLATT Eventually, Florence had to break the news to her family that she, too, was infected with the deadly HIV virus. With treatment beyond her family's means, her plight echoes a death sentence ringing across sub-Saharan Africa. Adults between the ages of 20 and 60 are being wiped out, contorting the population pyramids of countries ravaged by AIDS into a haunting shape, with large numbers of children at the base, disappearing adults in the middle, and the few surviving seniors on top.

DAVID BLOOM AIDS is cutting a huge swath through sub-Saharan Africa's strongest resources, its people, its working-age people. And that is imposing a huge burden in those countries. There are currently 11 million orphans in sub-Saharan Africa. Never before in history have we seen such a colossal burden as the number of orphans that will overwhelm the capacity of the usual social institutions that we have to deal with them.

NOVA JEFFREY SACHS Columbia Univ. Earth Institute

JEFFREY SACHS Africa is living in an utter catastrophe right now: millions and millions of people dying of preventable and treatable disease, millions of children becoming orphaned. Impoverished people can't face these challenges on their own.

OLIVER PLATT Today the epidemic is spreading fastest among women. In fact, an African woman's greatest chance for getting infected is within marriage where condoms are rarely used when families are hoping for children.

NOVA ZEDA ROSENBERG Int'l Partnership for Microbicides

ZEDA ROSENBERG Right now, a woman has to make a choice between having a child or putting herself at risk of HIV infection. And because of that, ah, it is clear that a prevention strategy for them is crucial.

OLIVER PLATT There may soon be a breakthrough that will save women's lives. At the Population Council in New York City, scientists have discovered compounds that prevent the HIV virus from infecting human cells. Called microbicides, the hope is that they will chemically block or kill the virus during intercourse. The goal is to develop a vaginal gel that can protect women from disease if their partners fail to wear a condom.

ZEDA ROSENBERG Some of these products may also have the ability to be contraceptive. But I think the main issue is that a woman has control over its use. She can decide when to use it.

NOVA GEETA RAO GUPTA Int'l Ctr. for Research on Women

GEETA RAO GUPTA As we've seen in the family planning world, it is women who primarily take responsibility for protection, and if microbicides were actually then made available to women even if they were 60% efficacious, not a hundred percent efficacious, even 60% efficacious they could avert millions of infections.

OLIVER PLATT In several sub-Saharan African countries AIDS has reversed population growth. But in most, births far exceed deaths partly because only 18% of women here use birth control, in contrast to 61% of women worldwide. Although more young people than ever will need family planning, funding has not kept pace. To complicate matters, the United States has

blocked support to clinics offering abortion related care or counseling, even if U.S. funds are not used for these services. As a result, many have closed.

NOVA THORAYA OBAID U.N. Fund for Population

THORAYA OBAID And it is a tragedy because birth rates are not just coming down just on their own, they're coming down because women are accessing family planning services. And when women can use contraception, they do not need to have abortions.

OLIVER PLATT The toll of unwanted pregnancy can be seen in the wards of Kenyatta National Hospital. Half of all adolescent girls in the country bear children by age 19. Many don't have the means to care for their babies and attempt illegal abortions.

PAMELA ONDUSO We've heard of young women using coat hangers, knitting needles, detergent, overdosing on anti-malarial medication. By the time the young women show up at a public health facility, very often they're bleeding, they're septic, and they're traumatized.

OLIVER PLATT But the doctors here stress that there's an obvious solution to this problem.

NOVA ROSEMARY MUGANDA Ctr. for Study of Adolescence

ROSEMARY MUGANDA Let's look at adolescent pregnancy, let's look at abortion, and let's look at AIDS. The reason why we say this is the common denominator there is unsafe sex. And this sexual activity is occurring in the absence of accurate and reliable information, and in the absence of services that would enable them deal with the consequences.

PAMELA ONDUSO And we know that there is an unmet need for family planning, and that this will only grow. Add to this the fact that you now have more and more young people entering their reproductive years, and you can see that we're sitting on a time bomb.

OLIVER PLATT In contrast to most African nations, Kenya has started its demographic transition. Its fertility rates have fallen to around four children per woman, although not yet as

low as India's average of three. With fewer babies being born, a changing age structure has opened up a rare window of opportunity for both countries.

NOVA DAVID BLOOM Harvard School of Public Health

DAVID BLOOM India and Kenya have a huge population that's just getting ready to enter the labor force, the prime working years, the prime reproductive years. If India and Kenya can keep fertility down, those resources that would have otherwise gone to children can be devoted to building up the productive capacity of the economy.

OLIVER PLATT This strategy transformed the once poor nations of South Korea, Taiwan, Singapore and Hong Kong. As fertility fell, these governments took money once spent on children and created jobs for young adults entering the work force. The economic gains of these Asian Tigers stunned the world.

DAVID BLOOM Economic growth in East Asia was not miraculous at all. It was, fundamentally, a demographic phenomenon, and it's a demographic phenomenon that can be repeated in other countries like India and Kenya. If they keep fertility down and invest in their young working age people, India and Kenya have an opportunity to escape the poverty traps that have ensnared them for centuries.

OLIVER PLATT It took until 1800 for global population to reach its first billion. In two centuries, the numbers increased six-fold. Our world is now headed towards a day of reckoning. If fertility drops just below two children, by mid-century, global population could stabilize at around nine billion people.

ALLEN HAMMOND The key is the education and, really, the liberation of women. When women have more control over their lives, then they'll have the number of children they want. And all the evidence is that women want fewer children.

2.35 Children 11 Billion 6 Billion

DAVID BLOOM Nevertheless, if women have even, on average, half a child more than our expectation, population could nearly double over the next 50 years. And that would involve an increase of over five billion individuals, which is historically absolutely unprecedented. It took us over 200 years to add the last five billion people on the earth. And that could happen again, in less than 50 years, going forward.

OLIVER PLATT With projections uncertain, what will the demands for energy, food and water be in the future? How will the other species with whom we share the planet fare? The next few decades will be a critical time to ensure the trend to smaller families and plan realistically for global aging.

JEFFREY SACHS Yes, there are huge challenges, but the biggest risk we face of all is inaction. We are not spectators to a world coming apart at the seams. If we mobilize our skills and our incomes and our wealth, even to a modest extent, we can help shift the world onto a path that is one of shared prosperity, that is one of environmental sustainability. In the end, the choice is ours.

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OLIVER PLATT We used to worry that population, too many people, would destroy the environment. Now we understand that there's something even worse: affluence.

OLIVER PLATT China is the world's biggest country, and as it becomes more and more affluent it will overtake the United States to become the world's worst polluter.

LESTER BROWN China uses more steel than the United States. China consumes far more grain than the United States. China, ah, you know, was once a billion poor people, but China's no longer a poor country.

OLIVER PLATT China may soon be the world's largest economy with a middle class of 300 million people, all consumers reaching for the good life: shopping, buying and even driving in record numbers. For many, it's the ultimate dream. But unless China cleans up its act, the dream could become an environmental nightmare, with a poisoned atmosphere, a world of dying forests and disappearing wildlife, flooded and baked by the searing heat of global warming. China is at a crossroads and decisions made here will affect everyone on the planet.

CHANGHUA WU As the most populous country in the world, the future of China's environment will play a big role in determining the future of the world environment.

OLIVER PLATT Can this Asian giant pull back from the brink before it's too late? World in the Balance: China Revs Up, right now, on NOVA.

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World in the Balance China Revs Up

OLIVER PLATT Along the rocky coast in Washington state, a steady wind blows in from across the Pacific.

Narrated by Oliver Platt Written by Chris Schmidt & Joel Olicker Produced and Directed by Chris Schmidt

OLIVER PLATT Every month, Dan Jaffe comes to check the quality of the air in this remote place near the northwestern most corner of the continental U.S.

NOVA DAN JAFFE Prof. of Atmospheric Chemistry

DAN JAFFE We started the station to try to understand, "What's the quality of the air that's blowing into the United States?" This would be the air that comes in, and then we add our own local pollutants to it.

OLIVER PLATT The results were surprising. He and his team expected pristine ocean winds but their filters revealed a witch's brew of industrial poisons. A single canister like this could contain sulfur and mercury in varying concentrations, even killers like PCBs and DDT.

DAN JAFFE Most of the time, the concentration of these pollutants is fairly low, but once in a while, we get these large pulses of pollution that can get transported all the way across the ocean.

OLIVER PLATT The findings didn't seem to make sense. Air quality has been steadily improving over the last few decades, so where was the stuff in these filters coming from? To find out, Jaffe built a flying laboratory, an airplane loaded with sensitive instruments, able to sniff the prevailing winds in search of chemical clues. After dozens of flights over the ocean, Dan and his team constructed a detailed computer model that decisively fingered the culprit: China. From 3000 miles away, its pollution was reaching West Coast cities like Los Angeles and San Francisco, cities that had already spent billions cleaning up their own air. But there's another problem that the U.S. and China share. In America, our love affair with the automobile has

helped make the U.S. the world's biggest emitter of carbon dioxide, a greenhouse gas that's produced when anything burns. Many scientists believe that carbon dioxide in the atmosphere is causing the Earth to become overheated, with dangerous and unpredictable storms. And now China is following in America's footsteps. By the year 2030, China could match the U.S. in carbon emissions. If so, the two countries would contribute more to global warming than all other nations combined.

DAN JAFFE The United States has set the standard for high living, high energy use. We're one of the most consumptive countries in the world, and if the rest of the world emulates us, the global atmosphere is going to suffer. The world is going to suffer.

OLIVER PLATT China is exporting air pollution and carbon emissions, but we export our lifestyle. And China is one of our best customers.

OLIVER PLATT A winter morning in Beijing: the air is thick with what looks like fog. But it's not fog.

DING YIHUI The air in Beijing has been getting worse. It's mostly comprised of smoke, not fog. Urban haze is different than fog, which has water vapor, while this pollution doesn't.

OLIVER PLATT It's no secret where this smog is coming from. Even at 7:30 in the morning, the streets are already jammed with automobiles. Ten years ago, bicycles ruled these roads. But today, they're being forced aside. And that's just one change. Over the course of just a few short decades, the entire city has been utterly transformed into a modern megalopolis, home to over 13 million people. And other Chinese cities have grown just as dramatically. In the last two decades, more than 100 million people have moved from the countryside into urban centers, making this the largest migration in human history.

OLIVER PLATT Among the recent arrivals are 39-year old Xi Zhinong, his wife Shi Lihong and their four-year old daughter, Xixi.

SHI LIHONG Go brush your teeth and wash your face.

OLIVER PLATT The family had been living near Xi Zhinong's provincial home town in southwestern China, but a year ago, they decided to relocated to Beijing.

SHI LIHONG I'll help you in a second.

OLIVER PLATT They came in search of independence and opportunity, and to secure their young daughter's future. Their gamble seems to be paying off. They've just bought their first apartment, and they're living a 01:06:05]material life that would have been out of reach even a decade ago.

OLIVER PLATT Not only do they have cash in their pockets, but they also have plenty of places to spend it. Shopping malls like this one are springing up all over China. Here, everything a consumer could possibly want is for sale. From the latest in personal grooming -

UNKNOWN Press and release, press and release. It works on thick or thin clothes.

OLIVER PLATT - to the newest kitchen gadgets.

UNKNOWN The reason to add water is to get a finer texture. Level it and tighten. Try it.

NOVA ORVILLE SCHELL UC Berkeley School of Journalism

ORVILLE SCHELL Rising affluence does, ah, presume that people want more and more things. And it's a conveyor belt; it doesn't stop at any finite point. It used to be that the Chinese had what they call the five big things they all wanted. It was a radio, a sewing machine, and a bicycle. If you got those five big things, you know, you were considered at the top of the food chain. But now there's no limit to it. After you get the car, then you want the house and the TV and the satellite dish, and then to travel. And, you know, it goes on and on and on.

OLIVER PLATT The world has never seen a country get so rich, so fast. According to the Chinese government, the economy has grown at the red hot rate of eight percent every year for more than 20 years. Average incomes have quadrupled. And energy consumption has grown even faster. China has huge reserves of coal. Coal provides 70% of the energy used to generate electricity and to forge steel for construction and manufacturing. Over the years, industries increased their output to meet demand but without putting pollution controls in their smokestacks.

XI ZHINONG Are you ready? Are you cold? Not cold?

OLIVER PLATT Every day, when Xi Zhinong and Shi Lihong take Xixi to school, they expose themselves and her to Beijing's toxic air. According to the U.N., China is home to seven of the world's ten most polluted cities. And respiratory disease has become a leading killer, claiming lives at ten times the rate found in the United States. Even on what looks like a clear day, the air contains particulate dust, sulfur, lead, carbon monoxide and other poisons. Right now, that's the price of living in China's most economically advanced cities.

NOVA XI ZHINONG Wildlife Photographer

XI ZHINONG I worry about my own child growing up in this city. All she can see are gray skyscrapers under the gray sky. Sometimes I think that I don't belong here, but I'm living here because I really think it is best for my family.

SHI LIHONG Let's go in.

OLIVER PLATT Xi Zhinong is old enough to remember his country's recent past, when the nation's economy was in ruins. As recently as the 1970s, China was suffering the effects of one of the cruelest political experiments in history. Chairman Mao Zedong had tried, and failed, to industrialize the countryside in an effort called The Great Leap Forward. He ordered millions of

peasants to stop farming. He, instead, set them to work forging steel in primitive furnaces. But it led to disaster, a widespread famine that claimed more than 30 million lives.

NOVA KELLY SIMS GALLAGHER Harvard University

KELLY SIMS GALLAGHER One of the things that Chairman Mao was supposed to do in the communist revolution was to equalize ah, opportunity and quality of life for Chinese people. And by the end of the Cultural Revolution, China was as poor and impoverished as, perhaps, it had ever been.

NOVA

OLIVER PLATT Then in 1979, things began to change. A new, pragmatic leader named Deng Xiao Ping came to power. Deng needed to find a way to feed a billion people. He decided to rein in population growth no matter what the cost. He imposed a draconian new policy called the one-child rule. Under the plan, most Chinese families were restricted to a single child. The policy outraged human rights groups, as stories of forced abortions and sterilization began to leak out. But the leadership was determined to head off both a human and a political disaster.

NOVA BILL MOOMAW Tufts University

BILL MOOMAW If the population gets to be too large, there will be a famine. And if you look at Chinese history, often when there has been a famine there has been a revolution, and the, the, uhm, regime in power gets overthrown. It's a, it's a, it's a well-learned lesson in China; they've done the experiment many times. So this race between the stork and the plow, as it's sometimes called, uhm, can you produce enough food to feed the ba-- the new children? And so forth. So China has really actually, uhm, ah, slowed its population growth rather dramatically. I mean, there are lots of people in China, but the population is not growing that fast.

OLIVER PLATT Population control was a controversial first step toward the goal of turning China into a modern nation. Deng's next step sent a shockwave around the world. He set out to dismantle the communist economic system, abandoning the revolutionary ideals that had brought him to power. The Communist Party of China announced a surprising new policy: To get rich is glorious.

ORVILLE SCHELL In the early '80s, you could just see the streets slowly, ah, come alive with little shops and, and private entrepreneurs out there. And then, by the mid '80s, you began to see people actually renting shops from state-owned enterprises. And then they would rent the whole enterprise. And slowly, you got this foliation of all of these private business people.

OLIVER PLATT But the economic forces the party had unleashed were about to lead the country into an environmental nightmare: a 20-year binge of industrial development without any pollution controls.

NOVA PAN YUE China EPA

PAN YUE During the last two decades we were monomaniacal in our pursuit of development. That twisted policy put growth ahead of all else and caused us to neglect many other problems, like infrastructure, energy policy and the environment.

OLIVER PLATT Today, 25 years after Deng's reforms began, China's economy is still growing faster than any other on the planet. But despite its leap into the 21st century the country is still largely powered by a 19th century fuel. Every day, small factories, like this one, produce millions of coal cylinders for use in home cooking and heating stoves. The process has hardly changed for

over a century. Crushed coal and water combine to make a cake-like batter. An antiquated press turns the rough mixture into circular bricks.

OLIVER PLATT After drying, they emerge at the other end of the line. When an order comes in, a waiting messenger loads up his trike, and heads out to make a delivery. He'll ride miles through the crowded city streets to reach his customer. Most people in China use coal to heat their homes. China has begun to import natural gas and oil, and the largest buildings in Beijing have been retrofitted to use cleaner fuels.

MR. WEN Keep going.

1980 China USA

OLIVER PLATT Today's customer, Mr. Wen, a retired school teacher, prefers coal because it's cheap. Just two loads like this one will heat his three-room house for the entire winter for around \$50. But there's a problem with this cheap source of energy: coal is notoriously dirty. Burning it releases sulfurous smoke filled with poisonous chemicals. As China has become more affluent, the need for coal is greater than ever. This is Beijing's newest coal-fired power plant. It's only a few years old, but engineers are already adding a fifth turbine to meet ever-rising demand. In 1980, China burned roughly 400 million tons of coal, about half of the yearly total of the United States. But today China uses more than three times as much, 1.3 billion tons. That's nearly four times more than India, the world's second most populous country, and 25% more than the United States, the world's biggest energy consumer. This plant operates at about 40% efficiency, on par with most conventional power plants in the U.S. Until recently, China said that it couldn't afford to build these cleaner facilities. Now they can't afford not to.

NOVA JOHN HOLDREN Harvard University

JOHN HOLDREN The estimates of the Chinese themselves are that they're losing something in the range of six percent of their GDP to the public health costs from pollution: lost productivity,

ah, costs of health care, and so on, associated with pollution. They already know they have to fix it.

OLIVER PLATT The cost of confronting the country's legacy of pollution can be very high. This is the entrance to Capital Steel, China's third largest producer. Steel is an essential commodity. Without it, the Chinese economy would grind to a halt. Like electricity, steel production depends on coal. For decades Capital Steel was one of the biggest polluters in Beijing, until recently. In a rare and surprising move, the government ordered the company to install costly new pollution controls and to close an aging furnace, reducing steel output by 20%.

NOVA ZHANG JAI JUN Capital Steel

ZHANG JAI JUN What's standing behind us now is the abandoned former Number One steel factory. At the beginning of this year, we followed the government order to close it down because those facilities were relatively backward. It was very difficult to make this transition.

OLIVER PLATT Across China, the government has begun to close down factories that are too polluting, putting many people out of work. Although it's hard to predict, these closings may be a sign that China is moving into a new phase in its development, following a well-known path called the Kuznets Curve. In the 1950s, economist Simon Kuznets was charting the relationship between industrialization and the environment. He noticed that when countries first industrialize, pollution levels rise. As the process of modernization continues, levels eventually peak and begin to decline. He theorized that rising affluence plays a role; a more well-to-do population demands a cleaner environment. When a country reaches a critical level of affluence, pollution levels drop. England, the United States, Germany and Japan all followed this pattern. Most observers believe that China will eventually reduce industrial pollution. But at the same time, China is grappling with another problem, which may prove much more difficult to solve. In China's largest cities, the worst air pollution is no longer from smokestacks. It's from the tailpipes of cars. Just a few years ago, these crowded streets were nearly deserted. In 1995, the number of cars in all of China stood at a mere 2 million. Today, the number is 20 million and rising. Beijing has seen the most rapid growth of all, with 400,000 new cars rolling onto the city's roads in 2003 alone.

NOVA ORVILLE SCHELL UC Berkeley School of Journalist

ORVILLE SCHELL The car is the beating heart of this whole sort of consumer culture that, that China has become enamored of. And it's really one of the highest expressions of the individual's right: to go where you want, when you want, with whom you want. The car is the mother of all symbols and the highest stage of symbolic success.

OLIVER PLATT Today, it's increasingly hard to find a middle class Chinese consumer who doesn't own or want to own a car. Xi Zhinong and Shi Lihong moved to Beijing to start their own business. He's a photographer and she's a writer. Together they produce films about wildlife in China.

XI ZHINONG I was very close to them, just two meters away.

OLIVER PLATT These two are more environmentally conscious than most Chinese, but even they are talking about buying a car. Shi Lihong is the driving force behind the decision, so it's her job to shop for the family car.

UNKNOWN Where to?

SHI LIHONG The Asian Games Auto Market, please.

UNKNOWN Welcome to your ride in a Beijing taxi. Please help us improve our service.

SHI LIHONG It's a very difficult decision. We've saved some money, and there are financing plans available, so we can afford to buy a car. It's more convenient taking our daughter places. The bus can be so crowded, and in the winter it's too cold to ride a bicycle.

UNKNOWN And the traffic can be dangerous.

SHI LIHONG Right, with so many cars, sometimes we feel it's dangerous to put our daughter on a bicycle.

OLIVER PLATT The Asian Games car market is the largest in Beijing. Here, competing dealers share a large outdoor space to showcase dozens of different makes and models. But almost none of them are Chinese because 20 years ago China made a decision to let foreign companies make nearly all of its cars.

NOVA KELLY SIMS GALLAGHER Harvard University

KELLY SIMS GALLAGHER Well, remember, at that time, in the 1980s, there was very little foreign investment in China. So China went to these foreign auto companies and said, "We'd like you to invest in our country. We have a gigantic market of 1.2 billion people," and, "Please come and invest."

OLIVER PLATT First to take the Chinese up on their offer was Beijing Jeep, a joint venture between American Motors Corporation and the Chinese government. Party officials approved of Jeep's utilitarian, four-wheel drive design. Today, though, the factory is turning out something much different, upscale SUVs that cater to a consumer market that has grown faster than anyone expected.

NOVA PAUL ALCALA President & CEO, Beijing Jeep

PAUL ALCALA I think the primary factor that captures the imagination is just the magnitude of the numbers. The passenger car market grew here in China about 60% last year. Ah, this year, we were not expecting, ah, that rate of growth, but it looks like we may get up to 80% this year.

OLIVER PLATT Others, including Volkswagen, Ford, Suzuki, Toyota and the world's largest auto maker, General Motors, have since followed. All are hoping that China will take to cars like other affluent nations have.

NOVA PHIL MURTAUGH Chairman & CEO, General Motors China Group

PHIL MURTAUGH We believe that China will absorb almost 20% of the entire world's growth in vehicles over the next ten years. And somewhere around the turn of the quarter century, China will probably pass the U.S. as the world's largest, largest auto market.

UNKNOWN Hello.

SHI LIHONG Hello.

UNKNOWN Are you looking for a Jetta?

SHI LIHONG Yes, I'm looking at the price.

UNKNOWN It sells for 120,000 Yuan. It's the top of the line with a manual shift.

SHI LIHONG Mmm, how does it conform to environmental standards?

UNKNOWN All Jettas conform to the Euro II emission standard.

OLIVER PLATT This Volkswagen is a Chinese-built car, for sale only in China. The car looks as stylish and well-built as any American or European model. But looks can be deceiving. Under the hood lurks a dirty little secret. The Euro II emission standard, a proud selling point for the salesman, is actually ten years out of date. Today, Europe conforms to a much cleaner standard called Euro V. And American standards are even tougher.

KELLY SIMS GALLAGHER Chinese cars are just much more polluting than U.S. or European cars, and that's because they don't have the same emissions control equipment that the U.S. or European or Japanese cars have. A Chinese car would never meet emission control standards in the United States or Europe because the equipment in the Chinese cars is fairly antiquated.

OLIVER PLATT The Chinese were determined to learn how to build cars, and protecting the environment was not a priority. When the partnership deals were negotiated, the government failed to impose state-of-the-art environmental standards, and the car makers didn't insist.

PAUL ALCALA In terms of a foreign company doing business here, within China, we work within the framework and within the regulations. Ah, I've been very, ah, satisfied with the partnership that we see between the, ah, foreign joint ventures here and the Chinese government.

OLIVER PLATT Today, although China is addicted to outdated pollution controls in cars that are not fuel efficient, its auto industry has helped to lift millions out of poverty. Here at General Motors' Shanghai plant, workers earn up to 1000 Yuan per month, putting them in the top 20% income bracket. And each car that rolls off this assembly line contains steel, glass, rubber and other components fabricated by other workers in other Chinese factories, making cars one of the most powerful engines of the Chinese economic miracle.

ORVILLE SCHELL China's made the automobile industry a pillar industry. I think they're getting ever more dependent on it because it is expanding at such a ah, staggering rate and it's creating jobs. And there's one thing that China needs now: it's jobs.

OLIVER PLATT To keep up even with its modest population growth, China needs to create 15 million new jobs each year. By some estimates the auto industry and related businesses employ seven percent of the country's private sector work force, providing a living for tens of millions of people. Few consumers are pressing for more effective pollution controls that could raise the price of cars. And the government doesn't want to do anything that could slow down sales and cost the country jobs.

ERIK ECKHOLM The challenge of jobs and employment, I think, is one of the biggest headaches for the Chinese government. In fact, it's their biggest nightmare; they are so concerned about social stability, avoiding chaos, keeping the system together. You have, in the cities, tens of millions of former state workers now losing their jobs, very resentful. So if there is a severe slow-down or a real slump in economic growth, this will be very dangerous for the rule of the Communist Party.

ORVILLE SCHELL The government's got to keep this wheel spinning or they may end up getting spun right out of office. China has a terrible dilemma upon which it is impaled. It has to develop to improve the standard of living for people, and yet, at the same time, the environmental consequences of that development are so enormous.

OLIVER PLATT Every month, Beijing's 4x4 Club welcomes new members. Today, a half-dozen rookies are learning how to gun three tons of Jeep up a vertical embankment.

OLIVER PLATT Chinese consumers appear to be taking to gas-guzzling SUVs much as Americans have, without much concern about the environmental consequences.

PAUL ALCALA When we look at the SUV market, ah, in the U.S., I think the, ah, the market share is about 20 to 25% of the total market. Here, within China, the SUV segment is just beginning to expand. We see the SUV segment over the next five to 10 years more than doubling from the point we are today.

KELLY SIMS GALLAGHER If there were as many cars per person in China as there are today in the United States, China would have 800 million plus cars, which is four times more than we have in United States today.

OLIVER PLATT In the year 2000, the Chinese government used its absolute authority to ban leaded gasoline in a single stroke. The government could act just as decisively with emission

standards, but so far it is taking a gradual approach. But even the strictest standards cannot prevent an internal combustion engine from producing carbon dioxide as a byproduct of burning gasoline. And that means that China, considered the number two contributor to global warming, could become number one.

NOVA DING YIHUI China National Climate Center

DING YIHUI We estimate that between 2020 to 2030, China's emission of carbon dioxide will probably increase greatly. By then it will be hard to tell who is the largest emitter, China or the United States.

OLIVER PLATT China's economic miracle can only be sustained if it expands beyond cities to include the vast rural countryside.

OLIVER PLATT Weishan is a provincial community of 280,000, a market town surrounded by farms. It's where Xi Zhinong was born. The town is steeped in history, with 14th century architecture that dates back to the Ming Dynasty, but it's also facing a future full of change.

NOVA XI ZHINONG Wildlife Photographer

XI ZHINONG With the fast development China has seen in recent years, with the need for economic growth and improvement of people's living standards, China's cultural heritage is disappearing rapidly, although not so rapidly here. I know that, even as I feel happy to be able to see these ancient structures, the town has problems in that many people here are very poor.

OLIVER PLATT In rural China, hundreds of millions of people lack basic conveniences like indoor plumbing and, in some places, electricity. But the consumer culture is slowly making inroads here.

ERIK ECKHOLM The government, in part, is relying on what we used to call trickle-down economics, that if some parts of the country get a lot richer and some people get rich and invest, that the benefits will trickle down to the rest of the people.

OLIVER PLATT Improving the rural economy is vitally important to the entire country. Some 800 million people live in China's heartland. Increasing the disposable income in the pockets of so many people would not only lift them out of poverty, it would be a powerful stimulus to propel the nation's economy into the future.

Xi Zhinong has come home to the countryside to join in a family celebration, the birthday of his cousin's infant son, Liu Xiao. Liu Xiao is turning one, a particularly auspicious occasion in Chinese culture, even more important because he is an only child and likely to remain so. Couples no longer need to ask the government for permission to have children, but large families face higher taxes. That, and the cost of educating children, keeps families small.

ERIK ECKHOLM I think, even in rural villages, some of the poorer families that maybe ten years ago had four or five children, are now discovering that they can't afford to school their children. And so, while some may prefer to have two, and there's still some preference to have a son, ah, many families are accepting, quite willingly, that they will have one child.

OLIVER PLATT Most of these middle schoolers have never known a brother or a sister. As a result, they've enjoyed a higher standard of living. These kids watch TV and know what life is like in other places. Many of them will eventually move to a city, abandoning a way of life which has become too difficult.

OLIVER PLATT The life of a Chinese farmer has always been marginal and will continue to be for those who choose to stay on the land. For thousands of years farming has been the mainstay of rural China. Nestled in the valleys around Weishan, in Southern Yunnan Province, lies some of the most productive cropland in Asia. But like most of the farmland in China, there's just not enough of it. Though home to 25% of the world's population, China has only seven percent of the world's arable land. And it's been pushed to the breaking point. Every available acre has been put under cultivation. Even steep hillsides have been carved into terraces and farmed.

ERIK ECKHOLM Right now, too much of rural China is being farmed. And it's being farmed very inefficiently without producing much benefit for the people who live on the land.

OLIVER PLATT A typical family farm is less than an acre in size, large enough to provide food and possibly a small surplus to sell at Weishan's weekly market, but little else. The average cash income for peasants like this is less than \$25 a month. And it's getting hard to grow even enough food to make that tiny amount.

NOVA LESTER BROWN Earth Policy Institute

LESTER BROWN Between 1998 and 2003, grain production fell from 392 million tons to 326 million tons. This drop of 66 million tons is greater than the grain harvest of Canada for example. One of the reasons was because of spreading water shortages.

OLIVER PLATT China has limited fresh water reserves. As the country has grown more affluent, cities and industry have claimed water once used for agriculture. Farmers are facing a tough new reality: 1,000 tons of water used for irrigation yields crops worth about \$200. But the same thousand tons of water used in manufacturing produces goods worth a total of \$14,000. And as weather patterns change, perhaps as a result of global warming, China is becoming drier, aggravating its water shortage.

DING YIHUI The water problem will be much more serious if the climate keeps changing and becomes drier. Then what will we do about it?

OLIVER PLATT Chinese farmers are used to taking a beating from nature. In 1998, a devastating flood struck the Yangtze River valley. During the summer months, unusually heavy rains saturated the region. The Yangtze rose by more than 20 feet and stayed that way for weeks. It's ironic, but the same farmers who suffered from the disaster may have caused it, by stripping the hills of trees in order to grow crops. Trees absorb water and reduce run off. But when the

rains came, there was nothing to prevent torrents of water from pouring straight into the river basin. By the time the flood receded, thousands had died and millions had been left homeless. The government quickly ordered an end to farming on steep hillsides and began planting trees. The move cost tens of thousands of poor farmers their meager livelihoods, but if the government hadn't acted, more flooding would have followed. At the same time that crop yields are shrinking, China needs more food than ever because rising affluence has led to a richer diet. In Weishan's busy market, chicken, duck and pork are all in high demand. Meat consumption has risen by 400% in the last 20 years. To meet this increased demand for food, China has begun to turn to world markets.

LESTER BROWN I think within the next two years there will be a long line of ships stretching from the United States across the Pacific to China, loaded with grain, probably with two to three ships leaving every day. And this will be a new link between the two countries.

OLIVER PLATT To pay for imports, the country will need to create hundreds of millions of high-quality jobs.

NOVA ERIK ECKHOLM The New York Times

ERIK ECKHOLM Farming is not going to provide the jobs for the future; new industries are the only way out. The good side is that, as villagers have more money and more industry, they will stop ravaging the land so much. On the other hand, all the problems, the environmental problems of consumption and production will multiply very fast. Energy use will go up; ah, pollution in some ways will go up.

OLIVER PLATT Xi Zhinong and his family hope to see prosperity come to the countryside for the better life it will offer to Liu Xiao and his generation.

NOVA XI ZHINONG Wildlife Photographer

XI ZHINONG Everyone has the right to seek a better life. Why should people in the country live in the past?

OLIVER PLATT In most countries, environmental protection has come about when the government is forced to respond to public pressure.

DENIS HAYES We are systematically destroying our land, our streams, and our seas. We foul our air, and it's getting worse.

EDUND MUSKIE It means choosing cleaner cars rather than faster cars.

OLIVER PLATT China has an environmental movement, mostly made up of students, but it's rather small and timid. For all its economic advances, China is still ruled by the Communist Party with limited tolerance for dissent.

OLIVER PLATT Xi Zhinong has felt the consequences of standing up for the environment against the government. His work as a wildlife photographer frequently brings him to locations where environmental problems are acute.

OLIVER PLATT Today, he's in the Wang Lang forest preserve, China's oldest protected area. He and his guide are hiking up to 10,000 feet. They're looking for the golden snub-nosed monkey, a threatened species found only in China. For more than a decade Xi Zhinong has been studying and filming these elusive animals in their alpine habitat, which has been decimated by logging.

XI ZHINONG In 1992, when I started filming golden snub-nosed monkeys in Yunnan, commercial logging was still going on. So every time I lugged my gear onto a bus, what we passed most often were trucks full of logs, dozens of trucks even within a single day.

OLIVER PLATT At the time, Xi Zhinong was working for the forestry bureau. He knew much of the logging was illegal and that poachers used logging roads to gain access. But when he spoke up against it, he was fired from his job. Undaunted, he continued to work on his own, and after nearly 10 years of effort, he and his wife released a film that graphically showed the plight

of these threatened primates. The local authorities were shamed into cracking down. It was one of the first incidents where a public outcry and media coverage succeeded in safeguarding the environment, and Xi Zhinong hopes it is a sign of things to come.

XI ZHINONG Recently, the government is paying more attention to this problem, and the Chinese mass media has played a crucial role. More and more people are starting to pay attention to the environment.

OLIVER PLATT But even as China is beginning to see the light on the environment, some policymakers question whether a nation in the throes of new development should be held to the same standards as the industrialized countries, especially when it comes to carbon emissions and global warming.

NOVA JOHN HOLDREN Harvard University

JOHN HOLDREN What people too easily forget is that the great bulk of the problem, up until now, was caused by the industrialization of the countries that are now rich, the United States, Japan, Europe. And now we're saying to the developing countries, "Gee, we're terribly sorry. We used up the ability of the atmosphere to hold carbon dioxide, so you can't put any more in." This is not a welcome position.

OLIVER PLATT The fastest growing burden on the atmosphere, in both the U.S. and in China, comes from transportation. In crowded cities, mass transit would seem an obvious choice. Beijing has a brand new subway, but it's small and inconvenient. It has 100 kilometers of track but to serve the entire city it would need to be many times larger. But there's little public interest in mass transportation, China has fallen in love with cars. And even though the Chinese government has yet to mandate such basics as fuel economy standards, there is already talk of leapfrogging the technologies of the past.

NOVA XU JING China Ministry of Science

XU JING We don't want to follow the old path taken by the advanced countries, in which traditional gas-powered cars dominate the market. Therefore the government has attached great importance on developing new power systems, especially innovations such as fuel cells, and on having an impact within the auto industry.

UNKNOWN Let me say a few words about how this car works. It's a hy-wire. Hy means hydrogen; it's powered by a hydrogen fuel cell. Wire means drive by wire; all controls, such as steering, turning, and accelerating are executed electronically.

UNKNOWN Okay, ready?

OLIVER PLATT In Beijing, General Motors is showing off its hydrogen-powered concept car. Hy-Wire has no internal combustion engine. The auto is powered by a fuel cell, a device that uses hydrogen to generate electricity. It doesn't require a drop of gasoline. The only emission is water, pure enough to drink. But no one knows where the hydrogen will come from. It can be made from water but the process requires a lot of energy. It can also be extracted from coal, but that releases carbon and leads to global warming. General Motors in the U.S. has spent more than a billion dollars so far to develop this new technology, and there's no end in sight.

OLIVER PLATT China, with its massive population and fondness for cars, potentially offers a huge market for any company that can help it out of its environmental dilemma. But will the government create incentives through regulation?

NOVA KELLY SIMS GALLAGHER Harvard University

KELLY SIMS GALLAGHER If China introduced the toughest environmental standards in the world, no foreign auto company would walk away from 1.3 billion people and the second largest economy in the world. There is no doubt in my mind that the foreign auto companies could meet any standard that the Chinese government imposed.

OLIVER PLATT For now, fear of job loss has made the government slow to enact protective laws.

NOVA CHANGHUA WU The Green Development Inst.

CHANGHUA WU To some degree, this is a tug of war between the people in charge of the economy and those advocating for environmental protection. Where is the balancing point between these two? No one's found it yet.

OLIVER PLATT If China follows historical example, it will likely find a way to clean up its local air pollution. But as China grows in affluence, it joins the company of nations that seek the keys to solving a far more daunting problem, global warming.

JOHN HOLDREN Between the United States and China, both of our countries need to diversify our energy sources. Working on energy efficiency technologies like hybrid automobiles that can get far more miles per gallon, working on advanced renewable energy technologies, advanced nuclear technologies, fossil fuel technologies that can capture the carbon and keep it out of the atmosphere, all of that is a challenge not for any one country. It's a challenge for the whole world to confront and surmount together.