

Shaping the future of hospitality and travel: trends in energy, environmental, and labor force and work

Shaping the
future of
hospitality
and travel

129

Marvin J. Cetron

Forecasting International Ltd, Newtown, Connecticut, USA

Owen Davies

Department of Strategy and Trends, Forecasting International, Port St. Lucie, Florida, USA

Fred DeMicco

HRM, NAU, Flagstaff, Arizona, USA, and

Mohan Song

Department of International Business, Florida International University, Miami, Florida, USA

Received 8 March 2020
Revised 18 March 2020
Accepted 23 March 2020

Abstract

Purpose – The purpose of this study is to continue to forecast trends in the hospitality and travel industry with practical implications.

Design/methodology/approach – This study is the updated version of our previous list of trends. The new edition updates the previous report on the implications for the hospitality industry of major trends now shaping the future. We focus mainly on energy, environmental and labor force and work trends and discuss sub-trends under each trend. We then implicate how the trends affect the Hospitality and Travel industry.

Findings – We shared implications under each sub-trends.

Originality/value – The value of this article is to analyze the impact of the environment on the Hospitality and Travel industry from a macro perspective. For each trend, we implicate an estimate for future trends. We hope this article sheds light on the prediction of the Hospitality and Travel industry.

Keywords Tourism, Energy, Environment, Trends, Hospitality, Labor force and work

Paper type Viewpoint

For more than five decades, Forecasting International has conducted an ongoing study of the forces changing our world. In the 1980s, we condensed what we had learned into a list of trends we had seen at work in the world. We have updated that list frequently in the years since. For each study we undertake, we compare the specific circumstances of the industry, organization, or country with our trends and see how the two interact. The results have been gratifyingly accurate. In all, according to one of our clients, no fewer than 95% of our specific predictions based on an earlier version of this list proved correct.

The new edition updates our previous report on the implications for the hospitality industry of major trends now shaping the future. Whatever your concern, some of these trends will have a very direct impact upon it. Others will help to form the general environment in which we live and

© Marvin J. Cetron, Owen Davies, Fred DeMicco and Mohan Song. Published in *International Hospitality Review*. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licenses/by/4.0/legalcode>



work. They all merit attention from anyone who must prepare for what lies ahead. This study focuses on energy trends, environmental trends, trends in labor force and work.

Energy trends

- (1) Despite efforts to develop alternative sources of energy, oil consumption is still rising rapidly.
 - The world used only 57 million barrels of oil per day in 1973, when the first major price shock hit. By 2016, it was using 97 million barrels daily, according to the International Energy Agency (IEA). Oil use is expected to pass 100 million barrels daily in 2020, peaking at 103.5 million in 2040.
 - Three markets will maintain demand for oil through 2040: feedstock for petrochemicals and fuel for road freight and aviation. In all three, petroleum is hard to replace.
 - However, oil's share of world energy consumption is declining from 34% in 2012 to an expected 32.5% in 2020 and 30% in 2040.
 - The United States consumed 19.7 million barrels of oil daily in 2000. By 2015, this was down to 19.4 million barrels per day, about 25% of it imported.
 - By 2040, US oil consumption is expected to decline by 4 million barrels per day to levels not seen since the 1960s.
 - In most forecasts, the US stops importing energy by 2030.
 - Outside the US, the largest oil consumers are China, at just under 12 million barrels per day in 2015, and India, at 4.16 barrels per day. By 2020, China is expected to become the world's largest oil importer. India will become the second about 2035. By 2040, Asia will use three-fourths of the world's oil and 60% of its natural gas.

Implications

- Most of the hospitality and travel industry will find energy costs rise gradually to peak in the mid-2020s, then remain stable or decline slightly through 2040.
 - Two segments will see costs rising until oil is replaced by some equally portable energy-dense fuel: air travel and cruise lines.
 - The US economy will grow much less vulnerable to external price shocks as more of its energy needs are met domestically.
- (2) Contrary to popular belief, the world is not running out of oil.
 - The world's proven oil reserves have climbed steadily from about 660 billion barrels in 1980 to 1.662 trillion barrels at the beginning of 2016.
 - The US Energy Information Agency expects the global supply of crude oil, other liquid hydrocarbons and biofuels to meet global demand through at least 2040.
 - OPEC officials claim the 11 member countries can meet the world's energy needs for the next 70 years.
 - OPEC supplies about 40% of the world's oil and holds 60% of reserves and its production will reach 40.6 million barrels per day by 2020, up from 38.9 million in 2016—nearly half of the world's total projected increase in production.

- Even 80% of OPEC's estimated supply would still be enough oil to supply the world through 2050 and beyond.
- Oil production outside the OPEC nations has not yet peaked. In 2016, Russia became the world's largest oil producer. The US was in third place, China in fifth, Canada in seventh, and Brazil in tenth. The top five non-OPEC members pump nearly 29.5 million barrels per day, 18 percent more than the five largest OPEC producers.
- One laggard is Venezuela, which owns 20% of the world's proven reserves. The government's catastrophically bad management has cut production to roughly 2 million barrels per day, down by 1 million over 20 years. No improvement can be expected in the near future.
- India also is believed to own substantial reserves of oil in deposits beneath the Indian Ocean. It had proven reserves of just under 5.7 billion barrels at the beginning of 2016.

Implications

- If the price of oil rises significantly beyond current levels, new methods of recovering oil from old wells will become cost-effective. Technologies already developed could add nearly 50% to the world's recoverable oil supply.
 - One global risk is that Saudi Arabia and some smaller producers could be taken over by fundamentalist Islamic governments similar to Iran. This likely would deprive the US of a critical oil source and could force Europe to become much more accommodating toward Islamist views.
- (3) Oil prices are holding stable at \$65 to \$75 per barrel through at least 2020.
- Prices above \$140 per barrel seen in 2008 were an aberration that cannot be sustained now that many non-OPEC oil sources have come online. The actual cost of producing a barrel of oil and gas equivalent in March 2016 ranged from \$44.33 in the UK all the way down to \$8.98 in Saudi Arabia.
 - OPEC estimates that average prices will rise by \$5 per year, reaching \$65 in 2020.
 - Price increases continue to be restrained in the longer term, reaching \$92 per barrel (in 2015 dollars) by 2040.
 - Most American drillers kept pumping even when the price of West Texas Intermediate fell to \$30 per barrel in 2016. Shale oil, which now accounts for more than half of US oil output, begins to be profitable at \$30 per barrel and most wells at least break even when prices rise to \$60. High oil prices therefore have become self-limiting, as per-barrel prices much over \$55 bring more reserves online.
 - Now that an administration friendly to oil interests occupies Washington, the drilling almost certainly will begin in the Arctic National Wildlife Reserve and other areas once considered ecologically too sensitive for development.
 - The Trump administration also is likely to ease EPA regulations mandating production of super-low sulfur fuels, reducing the cost of gasoline in the US. Although this is likely to spur demand for oil, the comparatively low cost of production will continue to keep per-barrel costs in check.

- New oil supplies coming online in the former Soviet Union, China and other parts of the world also will make it even more difficult to sustain prices at artificially high levels.
- At full capacity, the 20 most industrialized countries all have at least three-month supplies of oil in strategic reserves. China plans to by 2020. India has enough oil to last about ten days. In times of extreme oil prices, many customer nations can afford to cut back their buying until the cost comes down.

Implications

- Destinations supplying their own renewable energy to well-insulated buildings will have a modest cost advantage over competitors that do not, in addition to attracting guests concerned with the environment. By 2030, this advantage will fade as renewables and energy-efficient construction evolve into business as usual.
 - This will continue to bolster profits for airlines, which coped with fuel costs that made up nearly 30% of operating expenses when oil prices were their highest, but only 19% in 2016.
 - This will help the cruise lines as well, despite substantial efficiency improvements in recent years. Carnival reported spending \$1.77 billion on fuel in 2008. By 2016, this had come down to \$920 million.
- (4) Growing competition from other energy sources also will help to limit the price of oil.
- Renewable energy sources provided 11.3% of global electricity in 2016. Installation of renewable power plants that year came to 138.5 GW – 55% of the world’s new generating capacity. Solar and wind energy are developing fastest, but biomass and waste-to-energy, geothermal, small hydro and marine power all are growing.
 - The prices of solar and wind energy have fallen 85% and 66%, respectively, over the seven years ending in 2016.
 - In the US, utility-scale photovoltaic energy cost \$46 to \$61 per MWh, discounting subsidies and taxes, compared with \$60 to \$143 for coal and \$97 to \$136 for nuclear. Wind energy was only \$32 to \$46 per MWh. In about a third of the country, wind energy plants are the cheapest to bring online, while utility-scale solar is cheapest in much of the Southwest.
 - Some projects have been even cheaper, with bids to build solar projects in 2016 as low as 3 cents per kWh in Mexico and the Middle East. In Chile, a developer in 2016 won a contract to sell solar-generated electricity for only 2.91 cents per kWh, about half the cost of coal.
 - Technology is eliminating the largest drawback to renewable energy: sun and wind are not always available. Technologies include Elon Musk’s Big Battery Project, storing solar heat in molten salt to run generators at night and pumping water to high-altitude reservoirs where it can be released to generate electricity when more power is needed.
 - Many countries have set ambitious goals to replace conventional energy with renewables.
 - Most of Europe plans to get 12–15% of its energy from renewable sources by 2020. EU policy targets 27% by 2030, with a raise to 30% expected.

- France has committed to 32% by 2030.
- Norway is aiming for 67.5% renewable energy by 2020, Sweden 49%, Finland 38% and Denmark 30%.
- China plans to get 15% of its energy from non-fossil sources by 2020, with non-fossil power climbing 48% in five years. The number of new permits issued for coal-fired plants there fell 85% in 2016.
- However, coal is still dominant in South and Southeast Asia, where India and other countries are planning to build coal-fired power stations well into the future. In addition to its commitment to renewables, China is expanding its coal- and gas-fired generating capacity by 19%. According to one study, a new coal-fired electric plant large enough to power a city of around 1.3 million people begins operation in China every seven to ten days.
- Natural gas is a fossil fuel, but much better for the environment than oil. It burns cleanly, and there is enough of it available to supply the world's total energy demand for the next 200 years. OPEC predicts that natural gas will overtake oil as the world's greatest source of energy around 2040.

Implications

- Though oil will remain the world's most important energy resource for years to come, two or three decades forward it should be less of a choke point in the global economy.
- New photovoltaic technologies will continue to raise the efficiency and reduce the cost of solar panels, reducing the space destinations need to generate electricity and making small-scale solar installations as cheap as today's utility-scale power plants. This will make it even more practical for many hotels and resorts to compete as environmentally friendly.
- It also will be easier for destinations in remote parts of Africa and other developing lands to supply developed-world luxuries like air condition at competitive prices.
- Declining reliance on oil eventually could help to reduce air and water pollution, at least in the developed world. By 2060, a costly but pollution-free hydrogen economy may at last become practical.

Environmental trends

- (1) People around the world are becoming increasingly sensitive to environmental issues such as air pollution, as the consequences of neglect, indifference and ignorance become ever more apparent.
 - In the United States, 74% of adults in a 2016 survey said, "the country should do whatever it takes to protect the environment." This included more than half of those identifying themselves as Republicans or Republican-leaning.
 - Some 55% of Americans rated the environment as a top policy issue President Donald Trump and Congress should tackle in 2017. Only protecting against terrorism and improving the economy were named more often as *the* top issue.
 - Nearly two-thirds of American adults say they worry "a great deal/fair amount" about global warming. And 61% said they always try to live in ways that protect the environment.

- In China, about one-third of the adult population consider air and water pollution “very big” problems, with another 41% rating them “moderately big.” Three-fourth consider climate change to be a “very serious” or “somewhat serious” problem.
- The Chinese government reportedly considers environmental problems to be the issue most capable of undermining its legitimacy.
- More than half of those polled in Latin America believe protecting the environment is more important than economic development. Numbers ranged from around 23% in Belize to about 63% in Brazil and Colombia.
- Add those who consider both important, and the number concerned about the environment ranges from 58% in Belize to 82% in Colombia.
- In a poll about climate change, Pew Research found that 54% of people around the world consider climate change “a very serious problem,” and 51% believe it “is harming people now.”

Regional results

Region	A very serious problem (%)	Is harming people now (%)
Latin America	74	77
Africa	61	52
Europe	54	60
Asia/Pacific	45	48
Middle East	38	26
United States	45	41
China	18	49

- In 2016 alone, there were major environmental protests in the United States, Germany, China, Vietnam, Russia (where the government has named 2017 the “Year of Ecology”), India, Brazil (where 185 activists were murdered in 2016) and many other countries.
- Governments are taking more active measures to protect the environment.
- An Indian court has ruled that glaciers and rivers are “living entities” and “persons” under the law, entitled to protections similar to those granted humans.
- New Zealand has passed a law recognizing the Whanganui River as a living entity, also with a right to legal protection. The Maori people consider the river an ancestor.
- A Dutch court ruled in 2016 that the government must cut greenhouse gas emissions by 25% in five years. Plans had called for cuts of only 14–17% by 2020.
- Norway became the first country to ban deforestation.
- Brazil has committed to restoring 12 million hectares of forests by 2030.
- China’s latest five-year plan, released in 2016, lowered targets for particulate emissions by 25% from previous levels and committed to sharp cuts in the amount of water and energy used and of carbon emitted per unit of GDP. Water

use per unit of GDP is scheduled to fall 23% by 2020, energy use—already down by 18%—by carbon by 18%.

Implications

- Worldwide, airborne particulates kill 3 million people a year. In London, the average resident dies nine to sixteen months early owing to air pollution.
 - If air pollution were halted instantly, it would take an estimated 200 years for carbon dioxide and other greenhouse gasses to return to pre-industrial levels. Whatever global temperature increase results from today's emissions is already inevitable.
 - Environmental policies will provoke a political backlash wherever they conflict with entrenched interests, as they have long done in the American West. However, the cost of not protecting the environment is too obvious to be ignored. Throughout most of the world, polluters and private beneficiaries of public assets will increasingly confront restrictive regulations designed to serve the interests of the community at large.
- (2) Water shortages will be a continuing problem for much of the world.
- The world's water supply will fall at least 40% short by 2030, according to the United Nations. One-third of the population of Africa and most of the major cities in the developing world will face water shortages.
 - An estimated 1 *bn* people already lack access to safe drinking water.
 - The northern half of China, home to perhaps half a billion people, already is short of water. The water table under Beijing has fallen nearly 200 feet since 1965.
 - Diversion of water from southern China has begun to reverse this decline, raising Beijing's water table by 0.42 m in 2016.
 - Desert now covers about 668,000 square miles and is spreading at a rate of about 1,300 square miles per year, affecting more than 400 million people.
 - Water usage is causing other problems as well. For example, irrigation water evaporates, leaving minerals in the soil. In 2014, 20% of the world's crop land was salty. By 2020, it will be 30%; by 2050, 50%. Salinization already is cutting crop yields in India, Pakistan, Egypt, Mexico, Australia and parts of the United States.
 - Pollution further reduces the supply of safe drinking water. In India, an estimated 77 million people lack access to safe drinking water, due to widespread pollution of rivers and groundwater, compared with 63 million in China and 58 million in Nigeria.
 - In ten countries, more than 40% of people lack access to safe drinking water. All but two are in Africa. The exceptions are Afghanistan and Papua New Guinea, which at 60% has the world's worst supply.
 - Water quality is a growing problem even in the developed lands.
 - In the US, tap water in at least 33 cities contains over 200 parts per billion (ppb) of lead, one with 10,000 ppb and another with 6,000 ppb. Federal regulations allow no more than 15 ppb, and many believe that standard is too lax.

- In 2013, the US Environmental Protection Administration rated 55% of the country's rivers and streams in "poor" condition, owing to pollution that often finds its way into city water systems. Forty percent of rivers and 46% of lakes were found too polluted for swimming, fishing or aquatic life. Tap water in 20% of cities contains toxic levels of lead.
- Cities such as Atlanta, where the delivery system is a century old and poorly maintained, suffer frequent water-main breaks, which suck dirt, debris, bacteria, and pollutants into the water supply. There are an estimated 850 such breaks each day in North America, more than 310,000 a year.
- Many ecologists believe that global warming will make drought much more frequent—even the norm—in the US west of the Mississippi.
- Contaminated water is implicated in 80% of the world's health problems. Water borne diseases kill an estimated 3.6 million per year, including 800,000 children who succumb to diarrhea.

Implications

- By 2040, at least 3.5 *bn* people will run short of water, almost 10 times as many as in 1995. By 2050, fully two-thirds of the world's population could be living in regions with chronic, widespread shortages of water.
 - Water wars are an imminent threat in places like the Kashmir: Much of Pakistan's supply comes from areas of Kashmir now controlled by India. Such problems as periodic famine and desertification also can be expected to grow more frequent and severe in coming decades.
 - Other present and future water conflicts involve Turkey, Syria, and Iraq over the Tigris and Euphrates; Israel, Jordan, Syria and Palestine over water from the Jordan River and the aquifers under the Golan Heights; India and Bangladesh, over the Ganges and Brahmaputra; China, Indochina and Thailand, over the Mekong; Kyrgyzstan, Tajikistan and Uzbekistan over the Oxus and Jaxartes rivers; and Ethiopia, Sudan and at least six East African countries, including Egypt, which share the Nile.
 - Impurities in water will become an even greater problem as the global population ages and becomes more susceptible to infectious diseases.
 - In the United States, repair of decayed water systems is likely to be a major priority for older cities such as New York, Boston and Atlanta. Cost estimates for necessary replacement and repair of water mains range up to \$1 trillion.
- (3) The effects of climate change, already making themselves felt, are growing quickly.
- The years 2014, '15, '16 and '17 each have set new records for average global temperature, which is up about 1.6 degrees from pre-industrial times. Sea-surface temperatures also are rising.
 - Sea level has risen about 3 inches between 1993 and 2016. There could be much more to come.
 - The minimum rise now considered likely is about 5 feet by 2100. It could be much higher. If all the ice now known to be melting is lost, it could raise sea level by nearly 50 feet.

- Glaciers have been losing mass steadily since at least 1945. By 2015, they averaged 30% smaller than at the start of the period.
- Greenland loses nearly 50 cubic miles each year. An increase of 2 or 3°C could melt all that remains—enough to raise sea level by 24 feet. Climate models say that Greenland will be at least 3°C warmer in this century and perhaps as much as 9°C warmer.
- The north-flowing Slims River in Canada, previously 15 miles long and nearly 500 feet wide, disappeared over four days in 2016 when the glacier where it originated melted enough to divert its water to the south.
- In western Tibet, a glacier in the Aru Mountains collapsed, killing herders and livestock in a nearby village. Average temperatures in the region have risen about 1.2°C in 50 years.
- Average air temperatures in the Arctic have risen about 5°C in the last century, 3°C since 1971, resulting in a steady loss of sea ice since 1995. Before then, ice covered an average of about 3 million square miles in September. Since 2010, the average has been less than 2 million. Given current trends, the Arctic will be free of ice by 2040. Forecasts say enough ice will melt in this century to raise sea level by about 2.5 feet.
- Antarctica is warming twice as fast as the rest of the planet. The glaciers of West Antarctica are melting rapidly. Evidence suggests that they eventually will melt completely, adding 10 more feet to global sea level. One glacier in East Antarctica also is melting. It is large enough to raise sea level by over 12 feet.
- Extreme one-day precipitation events in the US have been tracked since 1895. Nine of the top ten years for them have occurred since 1990. The number of such events has grown steadily since the 1980s, and the area affected by them has more than doubled.
- Worldwide, there are about six fewer hurricanes per year than in the mid-1980s, but in the North Atlantic the number of Category 4 and 5 storms, the most powerful, has doubled in 40 years. Typhoons in the North Pacific and northern Indian Ocean also are growing stronger.
- Plants and animals already show significant impact from climate change.
- A study of 976 plant and animal species worldwide found that 47% already have become extinct in part of their natural ranges.
- The Intergovernmental Panel on Climate Change estimates that 20–30% of plants and animals it studied could be at risk of extinction if global temperatures rise as much as expected by 2100.
- In one study of 35 European non-migratory butterfly species, 22 had ranges that shifted northward by 30–240 km over the past century.
- The National Wildlife Federation reports that 177 of 305 North American bird species have shifted their ranges an average of 35 miles north in the last 40 years.
- Climate change is warming the oceans, slowing current circulation and reducing populations of marine creatures. The areas most affected include six regions of exceptional biodiversity and many of the world's most important commercial fisheries.

- Warming oceans appear to be responsible for the death of coral reefs that support 25% of marine life. The US has lost half of its Caribbean reefs. Forty percent of Australia's Great Barrier Reef died off in 2016. In the ocean around Japan, corals have shifted their range by up to 14 km in the last century.

Implications

- Natural tourist attractions like the Great Barrier Reef seem likely to disappear within this century, some of them within the working lives of today's hospitality students. Small, low-lying ski resorts already are going bankrupt because they lack snow. They are only the first victims of what may be a long, difficult trend in the industry.
 - Grasses appear especially susceptible to rising temperatures, and they include species like wheat, corn, oats, and rice. A rise of 1°C, now considered unavoidable, is expected to cut wheat yields by 4.1–6.4% just when food demand is rising by at least 60%.
 - In Africa, 60% of the terrain used to grow beans is expected to become nonviable.
 - At the same time, ocean warming is likely to reduce fish catches, further impairing global food supplies.
 - Mosquitoes carrying diseases such as malaria, dengue fever, and West Nile virus are spreading farther from the equator as more temperate regions become habitable. The first known case of West Nile virus infection in the US occurred in 1999. By early 2017, it had been seen in 47 states and the District of Columbia with more than 2,000 cases reported to the Centers for disease Control and Prevention and 94 deaths.
 - Destinations in areas affected by these diseases could find tourism becoming less predictable and profits less reliable when vacationers shun outbreak sites as they did Brazil in 2015.
- (4) Industrial development trumps environmental concerns in some parts of the world.
- In 2017, the United States is chief among them. The Trump administration has done its best to gut the Environmental Protection Agency and NASA's Earth science program. President Trump appointed Scott Pruitt to head the EPA and rescinded Obama-era executive orders intended to protect the environment. Scientific data has been taken offline, government scientists forbidden to speak publicly about climate change. However, Congress overruled White House budget cuts for FY 2018, maintaining EPA funding at its existing level.
 - China's continuing construction of coal-fired generators despite its commitment to environmental reform demonstrates that industrial development retains strong and influential supporters.
 - After some 25 years of talking about the environment, Indian politicians have begun to speak of "balancing" environmental protections with economic growth. More than 1,600 attempts to block environmentally damaging or questionable industrial activities have been referred to the National Green Tribunal in recent years, with mixed results.
 - In the EU, a coalition of eight countries led by Germany and including Poland, Bulgaria and Czech Republic attempted to block new limits on power-plant emissions even though the standards were weaker than those in Japan, China and until recently the United States.

- Hydraulic fracturing for oil and gas faces very few restrictions in the US, the UK, Poland and some other countries—though not most of the EU—despite strong evidence that it pollutes aquifers and drinking water, triggers earthquakes and releases methane, a powerful greenhouse gas.
- Brazil recently has backed away from regulations—often poorly enforced—to protect the Amazon rain forest and other natural resources.
- Though India has announced that it will stop building coal-fired power plants in 2022, some 600 are now under construction or planned and due for completion by 2030.

Implications

- President Trump’s anti-environment measures will survive only as long as his administration does. However, the likely loss of experienced personnel at the EPA and NASA will have lasting effects on environmental programs until a new generation of scientists and administrators masters their roles.
 - Measures to raise employment in the coal industry will have no noticeable effect, as human miners have been replaced by machines and electric utilities have already committed to cleaner sources of energy.
 - Significant regions of the planet will be subject to pollution, deforestation and other environmental ills in the coming decades.
 - Attempts to limit global temperature increases to 2 °C are doomed to fail, ensuring that the impact of climate change will be much greater than optimistic estimates suggest.
- (5) Species extinction and loss of biodiversity will be a growing worry for decades to come.
- Some 50,000 species disappear each year, according to an estimate from the United Nations Environmental Program. The rate of extinction from human activity is estimated to be at least 100 times faster than the natural rate, and some authorities make it thousands of times faster.
 - The Center for Biological Diversity rates the current wave of species loss the worst die-off since the loss of the dinosaurs 65 million years ago. According to estimates, one in five species alive today now faces extinction, and that could rise to 50% by the end of the century, when the human population is expected to reach 11.2 *bn*.
 - Of the major causes, all are human activities:
 - Introduction of invasive species into fragile ecosystems. Since Burmese pythons were introduced into the Everglades, raccoons, opossum, and bobcats are seen 87–99% less often, and rabbits appear extinct within the park.
 - Climate change: The Intergovernmental Panel on Climate Change estimates that 20–30% of plants and animals it studied could be lost if global temperatures rise to the levels expected by 2100.
 - Deforestation: Some 46,000 to 58,000 square miles of forest are cleared each year. Orangutans already are near extinction because their habitat is being replaced by palm oil plantations.

- Urbanization and development: In the first 30 years of this century, cities will triple in area, consuming 463,000 square miles of delicate habitats, farmland and carbon-storing vegetation. An estimated 200 endangered species will go extinct as a result.
- Agriculture: People have transformed 37% of the planet's land into farms and pasture where little that is wild survives. Some 17% of the Amazon forest has been cleared for farms in the last 50 years.
- Poaching: In Africa, elephants, rhinoceros, mountain gorillas, and several other species are expected to die out, either because their habitats are being destroyed or because of illegal hunting. Lions are extinct already in seven African countries.
- Though commercial fishing is not known to have exterminated any species—largely because it costs too much to catch the last few members of a species—it is another important cause of species depletion. Stocks of cod, tuna, swordfish, marlin and sharks are down 90% since modern industrialized fishing began 40 years ago.

Implications

- Species loss has a powerful negative impact on human well-being. Half of all drugs used in medicine are derived from natural sources, including 55 of the top 100 drugs prescribed in the United States. About 40% of all pharmaceuticals are derived from the sap of vascular plants. So far, only 2% of the 300,000-known sap-containing plants have been assayed for potential drugs.
 - In Indonesia, home to one-eighth of the world's coral reefs, more than 70% of the reefs are dead or dying. The Indonesian economy loses an estimated \$500,000–\$800,000 annually per square mile of dead or damaged reef.
 - Researchers from the United Kingdom's National Environmental Research Council Centre for Population Biology report that diverse ecosystems absorb more carbon dioxide than those with fewer species. Loss of biodiversity thus is a potential cause of global warming.
 - Destinations specializing in wildlife tours and diving are likely to lose much or all of their business as significant species disappear. This will be especially hard on African resorts and tour operations in the coming decade.
- (6) Continuing urbanization will improve the world's economic efficiency, but at the cost of aggravating most environmental and social problems.
- Cities are economically productive. Just 600 cities produce some 60% of the world's GDP. They are expected to grow 1.6 times as fast as the world at large.
 - Between 2000 and 2030, the global population will grow by an estimated 2.2 billion. Of this total, 2.1 billion people will be added to the world's cities.
 - In 2000, some 2.8 billion people were urbanites, about 47% of the world population. By 2030, 60% of the global population will live in cities.
 - Two-thirds of urban growth will occur in China and India alone.

- The big are getting bigger. In 1990, there were just ten megacities, with populations over 10 million, in the world. In 2017, there are 31, 24 of them in developing countries.
- All ten of the fastest growing are in developing countries, including five in China. Thirty-five more have populations over 5 million, 32 in developing countries.
- Urbanization will proceed fastest in the developing lands, where more people are available to move into cities. In the more developed countries, 76% of the population already lives in cities; in the developing lands, only 40%.
- However, natural increase now accounts for more than half of urban population growth; at most, little more than one-third of urban growth results from migration.
- Up to 1 *bn* city dwellers lack adequate shelter, clean water, toilets, or electricity. In India alone, 500 million people defecate in the open because no sanitary system is available. The United Nations estimates that these problems cause 10 million needless deaths annually.
- Urbanization has profound environmental effects, none good.
- Fuels burned in cities produce 70% of global carbon emissions from human activity.
- At current growth rates, cities will use over three times more energy in 2050 than they did in 2005.
- NASA scientists point out that urbanization puts buildings and blacktop on the most fertile land, eliminating carbon-absorbing plants.
- Urbanization also deprives surrounding areas of water: Instead of sinking into the ground, rain is collected, piped to the city, used, treated as gray water and then discarded into the ocean. In some regions, such as near Atlanta, water levels in local aquifers are declining rapidly because the water that once replenished them now is lost.

Implications

- Cities' contribution to global warming can only increase in the years ahead.
- As the world's supply of potable water declines, people are concentrating in those areas where it is hardest to obtain and is used least efficiently.
- Deaths due to shortages of shelter, water, and sanitation can only grow. Epidemics will become still more common as overcrowding spreads HIV and other communicable diseases more rapidly.
- Since the growth is now due more to natural increase than to migration, programs designed to encourage rural populations to remain in the countryside appear misplaced. Education and family planning seem more likely to rein in the growth of cities. So will economic growth and programs designed to encourage two-income families. Women who work have much more control over their lives than those who do not and reliably produce fewer children.
- Urbanization benefits the travel and hospitality industry in at least three ways: It increases demand for hotel space in population centers, makes residents even more eager to escape harried daily lives, and on average gives them more income

than they would receive in rural or suburban regions, and more to spend on vacations.

Trends in labor force and work

(1) Education and training are expanding throughout society.

- Rapid changes in the job market and work-related technologies necessitate increased training for many workers.
- The US Bureau of Labor Statistics predicted that employment growth in the decade ending 2022 would average 10.8%. Jobs requiring a high-school diploma were expected to grow by 7.9%. Job categories requiring at least some post-secondary education were growing by an average of 14%. PhD openings were growing by 16.0%, those requiring a master's degree by 18.4%.
- Even some manual jobs now require extra training. In the forestry industry, the number of tree fellers is declining because complex machinery, which requires training to operate, gets their work done faster.
- However, there are many jobs that do not require post-secondary education that they will gain more openings, even at slower growth rates—8.8 million positions over the decade, compared with 6.8 million that call for more training.
- A second factor is the accelerating pace of R&D.
- As early as 1966, it was estimated that when engineering students graduated, half of what they had learned was already obsolete. Today, the half-life of an engineer's knowledge is two years or less. After 10 years, only 3% is still relevant.
- The half-life of biomedical knowledge is about five years. Research not only provides new discoveries, it often proves that what scientists and doctors believe is wrong.
- Teacher shortages, which slow this trend, are endemic throughout the world. The UN Educational, Scientific and Cultural Organization says providing universal primary and secondary education, one of eight UN Millennium Development Goals, will require 69 million more trained teachers.
- Shortages are worst in sub-Saharan Africa and South Asia.
- The Organization for Economic Cooperation and Development says 30% of head teachers in member countries say their school is understaffed or that teachers are poorly qualified.
- American schools ran short of teachers in 2015, about 60,000 short. At the same time, fewer students are entering the career. Between 2009 and 2014, student-teacher enrollment dropped from 691,000 to only 451,000, a loss of 35%. As a result, a deficit of about 100,000 teachers was expected in 2018 and every year thereafter until something changes. Teacher salaries average about 70% of those for other positions with similar levels of education.
- An exception is Finland, where teaching also is underpaid, though less so, but is a high-prestige career. In one case, 660 teaching positions attracted more than 6,000 applicants.

Implications

- Both management and employees must get used to the idea of lifelong learning. It will become a significant part of work life at all levels.
 - A substantial portion of the labor force will be in job retraining programs at any moment. Much of this will be carried out by current employers, who have come to view employee training as a good investment.
 - Even small businesses must learn to see employee training as an investment, rather than an expense. Motorola estimated that it reaps \$30 in profits for each dollar it spends on training.
 - The rise of Internet-based education makes it possible for people to educate and train themselves for high-tech careers. In 2012, a 15-year-old from Ulan Bator, Mongolia, got a perfect score in the online version of MIT's sophomore-level Circuits and Electronics course. A year later, he was attending the school in person.
 - The inevitable obsolescence of human knowledge will help drive the adoption of AI.
 - AI in turn will make training for new careers largely obsolete.
- (2) Specialization is spreading throughout industry and the professions.
- For doctors, lawyers, engineers, and other professionals, the size of the body of knowledge required to excel in any one area precludes excellence across all areas.
 - This is clearest in software engineering, where companies limit hiring for all but entry-level jobs to candidates whose experience exactly matches not only the position's duties but the software used to carry them out.
 - The same principle applies to artisans. Witness the rise of post-and-beam homebuilders, old-house restorers, automobile electronics technicians and mechanics trained to work on only one brand of car.
 - The information-based organization depends on ad-hoc teams of task-focused specialists to get its work done.
 - For hundreds of tasks, corporations increasingly turn to consultants and contractors who specialize more and more narrowly as worldwide markets become increasingly accessible and technologies differentiate.

Implications

- This trend creates endless new opportunities for small businesses and independent contractors. It also brings more career choices, as old specialties quickly become obsolete but new ones appear even more rapidly.
- However, it will be heavily impacted by the growing power of artificial intelligence. For example, in medicine radiologists are fast becoming obsolete as software learns to identify cancerous tumors and other anomalies as well as human specialists and sometimes better. Contractors will find themselves displaced from many fields that require high-level skills but deal with tasks that are essentially routine.

- (3) Services are the fastest-growing sector of the global economy.
- Service industries accounted for 58.6% of global GDP in 1995, according to data from the World Bank and OECD. By 2014, they made up 68.45%. In 2010 constant dollars, this translates to an almost straight-line rise from \$26.57 trillion to \$45.45 trillion.
 - Service industries provided 77% of private nonfarm jobs in the United States in 2008. By 2018, they were expected to provide 131.1 million jobs, nearly 79% of total employment.
 - In the decade ending 2020, services are expected to account for virtually the entire net gain in US employment. In April 2017, a typical month, service industries added 165,000 new jobs, wholesale and retail trade 14,000, and goods-producing industries only 12,000.
 - Twenty-nine of the top 30 fastest growing occupations are in the service sector.
 - The strongest growth is expected in educational services, healthcare and social assistance and professional and business services. All three are expected to grow more than twice as fast as the overall economy. Positions for home health aides, physical therapists, and financial advisers are expected to grow more than 30% through 2024.
 - In the EU, services provide more than 70% of both GDP and jobs.
 - They might provide more, but government policies designed to create a single Europe-wide service market have discouraged investment and employment growth in the sector.
 - Service jobs have replaced many of the well-paid positions lost in manufacturing, transportation and other fields. These new jobs, often part-time, pay half the wages of manufacturing jobs.
 - Not all service jobs are badly paid. Physicians, computer professionals and financial planners all are service workers with average earnings near or into six figures. Common factors: extensive training, high skills and scarce opportunities compared with badly paid low-skill jobs.
 - Many low-skilled service positions in administration and transport are being automated quickly. Typical at-risk occupations include positions in banking and booking/reservation work in the hospitality and travel industry.

Implications

- Services now compete globally, just as manufacturing industries have done since the 1990s. By creating competitive pressure on wages in the industrialized lands, this trend helps to keep inflation in check.
- However, replacement of well-paid industrial jobs by service occupations has slowed income growth dramatically. This is a major reason American workers have been losing constant-dollar disposable income even as nominal wages have continued to grow.
- This is yet another mandate for broad-scale education and training to prepare workers for higher-skill, higher-wage service jobs. This is most urgent for the unemployed. However, the single greatest share of job training—about half in Europe—is conducted or paid for by employers.

- This need will become more urgent as it grows clear that AI and automation are supplanting human workers. By the mid-2020s, the need for public job training will become an important political issue in the United States and Europe.
- (4) Workforce participation in the United States is falling, especially among men.
- Among men age 20 and over, seasonally adjusted workforce participation fell from 76.3% in January 2007 to 71.5% at the end of 2016. Among women, it declined from 60.8% to 58.2%.
 - Participation rates vary widely among states. In some, labor force participation among men age 25 to 54 is as low as 45%.
 - In this, the US is an exception. Data from OECD countries shows that participation rates either have been climbing steadily for decades or have become roughly stable since the early 2000s.
 - The difficulty of finding work after prolonged unemployment contributes to this trend. In a 2016 poll, 43% of jobless reported having completely given up looking for work. Among the long-term unemployed, the number was 59%. In 2017, with the official employment rate approaching 4%, one-third of the unemployed still remained on the sidelines.

Implications

- During periods of high employment, this trend aggravates worker shortages and helps to constrain business expansion.
 - It also reduces income-tax revenues and the federal discretionary spending that requires them.
 - Because many dropouts from the workforce are recognized as disabled—more than 12% aged 55–64 as of 2014—this trend also greatly increases the cost of Social Security disability payments and other services for those who can no longer work.
- (5) Workers are retiring later as life expectancy stretches.
- OECD data show that a trend toward early retirement in the developed world has ended. In 21 rich countries, age at retirement has been rising since 2006. Workforce participation in OECD member states declined sharply from 1960 on, reaching a minimum of 10% in 1986 and recovering to 14.1% in 2015.
 - The Great Recession accelerated this trend in all but the hardest-hit countries, where there were no jobs to be had.
 - In the United States, the fraction of workers among those over 65 fell dramatically from the early 1960s to a 1985 minimum of 10.8%. Since then, it has risen almost steadily to 18.9%.
 - Better health gives today's seniors more options late in life. In the US, more than half of early retirees cite a health problem or disability as the reason they stopped work.
 - Americans often return to work and delay complete retirement for several years.
 - A brief delay is legally required, as the qualifying age for full Social Security benefits rises from 65 to 67 for those born in 1960 or later.

- In the US, most younger Baby Boomers expect to continue working after age 65. The youngest will reach that age in 2029.
- In the EU-28 countries, full-time employment remains rare over 65. The average was only 5.6% in 2015. Nonetheless, labor participation rates have been rising among seniors since about 2005, earlier in some countries and part-time work is increasingly common. This is due in part to the growing number of women who remain on the job.
- Post-65 workforce participation varies widely from one country to another. Spain, at just 1.9%; Belgium, at 2.6% and France, at 2.7%, are offset by countries like Ireland, Portugal and Estonia, where the figures are 10.9%, 11.6% and 22.8 %, respectively.
- The EU's official Europe 2020 Strategy aims to raise the average retirement age to compensate for the shrinkage in the prime-age workforce owing to sub-replacement birth rates.
- Senior workers tend to be most numerous in Asia. In Japan, 22.1% are still at work after age 65. In India, the number is 27.3% (as of 2014). South Korea reports that 31.2% remain in the workforce. In Indonesia, it was 37.3% in 2013.
- China has not reported senior workforce participation since 2010, when the official number was 21.1%. Note that Beijing tracks employment only among those whose paperwork identifies them as city-dwellers. In rural areas, everyone is assumed to work in farming, which may well be accurate.

Implications

- This trend will spread throughout the industrialized countries and many industrializing lands as the retirement-age population grows and the number of active workers to support them declines.
- It will be strongest in China and other countries where retirement programs are weak or absent and prime-age populations are declining. By 2025, we expect retirement in the United States to be delayed into the 70s, on average, because the Baby Boom generation has not saved for retirement. Half of 50-plus workers have less than \$25,000 in savings and investments.
- Those who have calculated how much they will need comfortably in retirement—only 45%—usually estimate \$250,000–\$500,000.
- People increasingly will work at one career, “retire” for a while (perhaps to travel) when they can afford it, return to school, begin another career, work part-time at home and so on in endless variations. True retirement, a permanent end to work, will be delayed until very late in life.
- This will help to ease worker shortages during periods of peak employment. For example, in March 2017, nearly one-third of US metropolitan areas had unemployment rates under the 4% usually considered to represent full employment. In some cities, it was as low as 2%, and employers were finding their businesses constrained by lack of workers.
- In the long run, it could prove impossible to maintain the tradition of retirement, except through personal savings and investment. However, by then the rise of artificial intelligence and other forms of advanced automation are likely to make the issue moot. (See Trend 32.)

- Older workers will partially make up for the shortage of entry-level employees. The chance to remain in the workplace will reduce the risk of poverty for many elderly people who otherwise would have had to depend on Social Security to get by.
 - Travel and hospitality will find courteous, conscientious post-retirement workers well suited to guest-service roles.
 - Growing numbers of the semi-retired will find positions in education, helping to make up for the chronic shortage of qualified teachers, especially in the sciences.
 - The growing ability of AI and other forms of automation to replace human workers will soon abort this trend. We expect the number of elders who remain on the job to begin declining again no later than 2025.
- (6) Employment mobility is growing, with multiple careers becoming common, as more people make mid-life changes in occupation.
- In the US, where statistics are easiest to obtain, younger Baby Boomers, born from 1957 through '64, held an average of 11.7 jobs between ages 18 and 48. Twenty-seven percent held 15 jobs or more.
 - One-third of the workforce now changes jobs each year.
 - The fast pace of technological change makes old careers obsolete, even as new ones open up to replace them.
 - People now change careers every 10 years, on average.
 - The pace slows rapidly after age 45, when 80% of people consider changing their careers, but only 6% do.
 - Rates are lowest among blue-collar workers, who may be most in need of a new way to earn a living.
 - A recent Louis Harris poll found that only 39% of workers say they intend to hold the same job five years from now; 31% say they plan to leave their current work; 29% do not know.
 - Government programs to retrain workers for new careers have had limited success. One called Georgia Work\$ was so successful that a proposed federal program during the post-Great Recession period was modeled on it. On closer examination, companies providing on-the-job training through the program kept on only one in four of the 23,000 workers who completed training.

Implications

- This trend will accelerate as AI and advanced automation make ever more of today's occupations obsolete.
- Moving displaced workers into new careers will be even more difficult than many observers now recognize.
- "Earn while you learn" takes on new meaning: Most people who can will have to study for their next occupation, even as they pursue their current career.
- In many two-earner couples, one member or the other will often take a sabbatical to prepare for a new career.

- Self-employment is becoming an increasingly attractive option, as being your own boss makes it easier to set aside time for career development. This is especially true for generations *X* and Dot-com.
- Retirement plans must be revised, so that workers can transfer medical and pension benefits from one career to the next—a change that has long been needed.

(7) Two-income couples are becoming the norm in many countries.

- In 75% of US households, both partners will work full time by 2005, up from 63% in 1992.
- The percentage of working-age women who are employed has grown steadily throughout the industrialized world. In the United States, it has grown from 46% in 1970 to 68.8% in 2000. The lowest are Italy, Spain and Mexico, with just 40% of working-age women employed, according to the Organization for Economic Cooperation and Development (OECD).
- This emphasis on work is one big reason the richest 25%–50% of the US population has reached zero population growth. They have no time for children and little interest in having large families.
- The number of working mothers with young children is actually declining. Only 58% of married women with children under 3 held jobs in 2002, compared with 61% in 1997. At the same time, the number of married working women with children under a year old fell from 59% to 53%.

Implications

- Demand for on-the-job child care, extended parental leave and other family-oriented benefits can only grow. In the long run, this could erode the profitability of some American companies, unless it is matched by an equal growth in productivity.
 - Two-career couples can afford to eat out often, take frequent short vacations and buy new cars and other such goods. And they feel they deserve whatever time-savers and outright luxuries they can afford. This is quickly expanding the market for consumer goods and services, travel and leisure activities.
 - This also promotes self-employment and entrepreneurialism, as one family member's salary can tide them over while the other works to establish a new business. Look for families that usually have two incomes, but have frequent intervals in which one member takes a sabbatical or goes back to school to prepare for another career. As information technologies render former occupations obsolete, this will become the new norm.
- (8) The Millennial and Centennial generations already are beginning to change society's priorities.
- There are 74.5 million Millennials – born from 1981 through 1997 – in the United States; worldwide, they already make up one-fourth of the workforce. Centennials, born after 1997, number almost 84 million in the US and about 1.3 billion the world. By 2020, their population is expected to reach 2 billion.
 - Generation *X*, ages 37 to 52 in 2017 and now beginning to reach upper-management positions, numbers only about 68 million in the US.

- There are approximately 50 million people in Europe between the ages of 15 and 24; 30 million more are between 25 and 29. The under-30 cohort represents about 22% of the European population.
- The two youngest generations are particularly vast in India, the Muslim lands and parts of Africa.
- More than half of India's population is under 25, 65% under 35.
- More than half of Egypt's labor force is under 30. Half of Nigeria's population—167 million in all—is between 15 and 34. In Afghanistan, Angola, Chad, East Timor, Niger, Somalia and Uganda, more than two-thirds of the population is under 25.
- China's one-child policy, now abandoned, has skewed its population toward old age. Only 30% are under 25. By 2025, about 20% of the population will be over 65. By 2050, its workforce will shrink by nearly one-fourth.
- Throughout the world, the Millennial and Centennial generations have more in common with each other than with their own elders, thanks largely to the global reach of the internet and of television before it.
- In the US and Europe, the under-20 group is remaining in school longer and taking longer to enter the workforce than before.
- Generation X, the Millennials and the Centennials are proving to be very business-oriented, each more so than the last, until the youngest care for little but the bottom line.
- Their entrepreneurial impulse is strong. Twice as many say they would prefer to own a business rather than be a top executive. Five times more would prefer to own a business than hold a key position in politics or government.
- Issues of race and ethnicity that obsessed earlier generations are for Millennials and Centennials almost beneath notice.
- Many in these generations are economically conservative. On average, those who can begin saving much earlier in life than their parents did in order to protect themselves against adversity.
- Gen X made money in the stock market boom of the 1990s, then lost it twice, first in the "dot-bomb" contraction of the early 2000s and again in the Great Recession. Yet, most have left their money in the market.
- Millennials and Centennials have learned from their example, but time is still on their side.
- This also has reinforced a sense that all things are transient, with few people and no institutions to be trusted.
- They are highly independent in their goals and priorities, yet generally work well in groups when they can reach their goals most efficiently by doing so.
- Growing up with laptops and smartphones has made Millennials and Centennials more adept with technology than Boomers, and even Gen X, ever can be.
- Growing up with the internet has also addicted them to social media. Yet, it is Generation X that spends the most time with Facebook, Twitter, Instagram and their competitors.

Implications

- Although generations have common characteristics, individual variation overwhelms them. Nothing said about any group will apply to all its members.
 - Employers must adjust their policies and practices to fit the values of these new and different generations, including finding new ways to motivate and reward them. The younger generations all thrive on challenge, opportunity, and training—whatever will best prepare them for their next career move. Cash is just the beginning of what they expect.
 - For these generations, lifelong learning is nothing new; it's just the way life is. Companies that can provide diverse, cutting-edge training will have a strong recruiting advantage over competitors that offer fewer opportunities to improve their skills and knowledge base.
 - From Generation X on, they are increasingly well equipped for work in an increasingly high-tech world but have little interest in their employers' needs. They also have a powerful urge to do things their way.
 - As both customers and employees, they will demand even more advanced telecommunications, Net-based transactions and cutting-edge technology.
 - Growing up with parents eager to nurture their individuality and sense of security has given Millennials and Centennials an intense need for recognition when they accomplish even modest work tasks.
- (9) Growing stress increasingly erodes quality of life.
- As real buying power shrinks for the middle and lower economic classes, money is the most important stressor.
 - In the US, 65% of workers polled cited it as a “somewhat” or “very significant” source of stress.
 - Nearly 75% said money issues had caused them extreme stress in the previous month.
 - Among those with partners, nearly one-third reported money was a major source of conflict in their relationship.
 - Time is another factor. Statistically, American men now work for pay 12 h a week less than they did 40 years ago, just over 35 h, on average, or 1,789 h per year. Yet, many are working longer.
 - Email and smartphones have turned off-duty hours into working time, whether we get paid for them or not. Sixty percent of workers with smartphones are connected to their jobs 13.5 h or more each day.
 - College-educated men lost six hours of leisure over the 20 years ending in 2005.
 - A survey of 1,000 professionals found that 94% averaged at least 50 h of work per week. Nearly half worked 65 h.
 - Outside the US, workers regularly spend even more time on the job: 1,853 h in Israel, 1,985 h in Russia and 2,505 h in Hong Kong.
 - The UK is an exception: 40% of managers there put in more than 60 h a week.

- Other issues are significant as well:
- In Europe, more than 14% of workers report being threatened with physical violence at work. More than 8% in public administration, education and health report actual incidents of violence.

Implications

- Stress-related problems affecting employee morale and wellness will continue to grow. Companies must help employees balance their time at work with their family lives and need for leisure. This may reduce short-term profits but will aid profitability in the long run.
- This is especially an issue in the hospitality industry, where staff tensions, harassment and in hotels and restaurants even threats of violence are too common.
- Single workers and two-income couples are increasingly desperate for any product that offers to simplify their lives or grant them a taste of luxury—and many can afford to buy it.
- Time pressure offers new opportunities for hospitality companies to provide more weekend getaways, three-day cruises, “staycation” attractions, and similar products. Those including travel to the destination will be particularly attractive.
- As time for shopping continues to evaporate, Internet and mail-order marketers will have a growing advantage over traditional stores.
- Online marketing and reservations, already a major trend in travel and tourism, will be increasingly significant, even for segments that have resisted these practices.

Further reading

- Cetron, M.J. (1972), “Technological forecasting for the military manager”, *An introduction to technological forecasting*, Vol. 1, p. 51.
- Cetron, M.J. (1988), “Class of 2000: the good news and the bad news”, *The Futurist*, Vol. 22 No. 6, p. 9.
- Cetron, M.J. (1994a), “An American renaissance in the year 2000: 74 trends that will affect America’s future – and yours”, *The Futurist*, Vol. 28 No. 2, p. SS1.
- Cetron, M.J. (1994b), “The future face of terrorism”, *The Futurist*, Vol. 28 No. 6, p. 10.
- Cetron, M.J. (2009), “Timeline for the future: potential developments and likely impacts”, *The Futurist*, Vol. 43 No. 2, p. 33.
- Cetron, M.J. and Clayton, A. (1975), “Social forecasting: a practical approach”, *Technological Forecasting and Social Change*, Vol. 7 No. 4, pp. 339-355.
- Cetron, M. and Davies, O. (1991), “50 trends shaping the world”, *The Futurist*, Vol. 25 No. 5, p. 11.
- Cetron, M.J. and Davies, O. (2001a), “Trends now changing the world: economics and society, values and concerns, energy and environment”, *The Futurist*, Vol. 35 No. 1, p. 30.
- Cetron, M.J. and Davies, O. (2001b), “Trends now changing the world: technology, the workplace, management, and institutions”, *The Futurist*, Vol. 35 No. 2, p. 27.
- Cetron, M.J. and Davies, O. (2005), “Trends now shaping the future: economic, societal, and environmental trends”, *The futurist*, Vol. 39 No. 2, p. 27.
- Cetron, M.J. and Davies, O. (2008), “Trends shaping tomorrow’s world: forecasts and implications for business, government, and consumers (part one)”, *The Futurist*, Vol. 42 No. 2, p. 35.

- Cetron, M.J. and Davies, O. (2010a), "Trends shaping tomorrow's world: economic and social trends and their impacts", *The Futurist*, Vol. 44 No. 3, p. 35.
- Cetron, M.J. and Davies, O. (2010b), "Trends shaping tomorrow's world: forces in the natural and institutional environments", *The Futurist*, Vol. 44 No. 4, p. 38.
- Cetron, M.J. and DeMicco, F.J. (2006), "Club medic", *Hospitality Review*, Vol. 24 No. 2, p. 2.
- Cetron, M.J. and Gayle, M.E. (1990), "Educational renaissance: 43 trends for US schools", *The Futurist*, Vol. 24 No. 5, p. 33.
- Cetron, M.J., Rocha, W. and Luckins, R. (1988), "Into the 21st century long-term trends affecting the united", *The futurist*, Vol. 22 No. 4, p. 29.
- Cetron, M.J., Davies, O., Steele, S.F. and Ayers, C.E. (2009), "World war 3.0: ten critical trends for cybersecurity", *The Futurist*, Vol. 43 No. 5, p. 40.
- Cornish, E. (2011), "Marvin J. Cetron on terrorism and other dangers", *The Futurist*, Vol. 45 No. 5, p. 43.
- Demicco, F.J. and Cetron, M. (2006), "Club medic", *Asia Pacific Biotech News*, Vol. 10 No. 10, pp. 527-531.
- Martino, J.P. (Ed.) (1972), *An introduction to technological forecasting*, Vol. 1, Taylor & Francis.

Corresponding author

Mohan Song can be contacted at: msong001@fiu.edu